

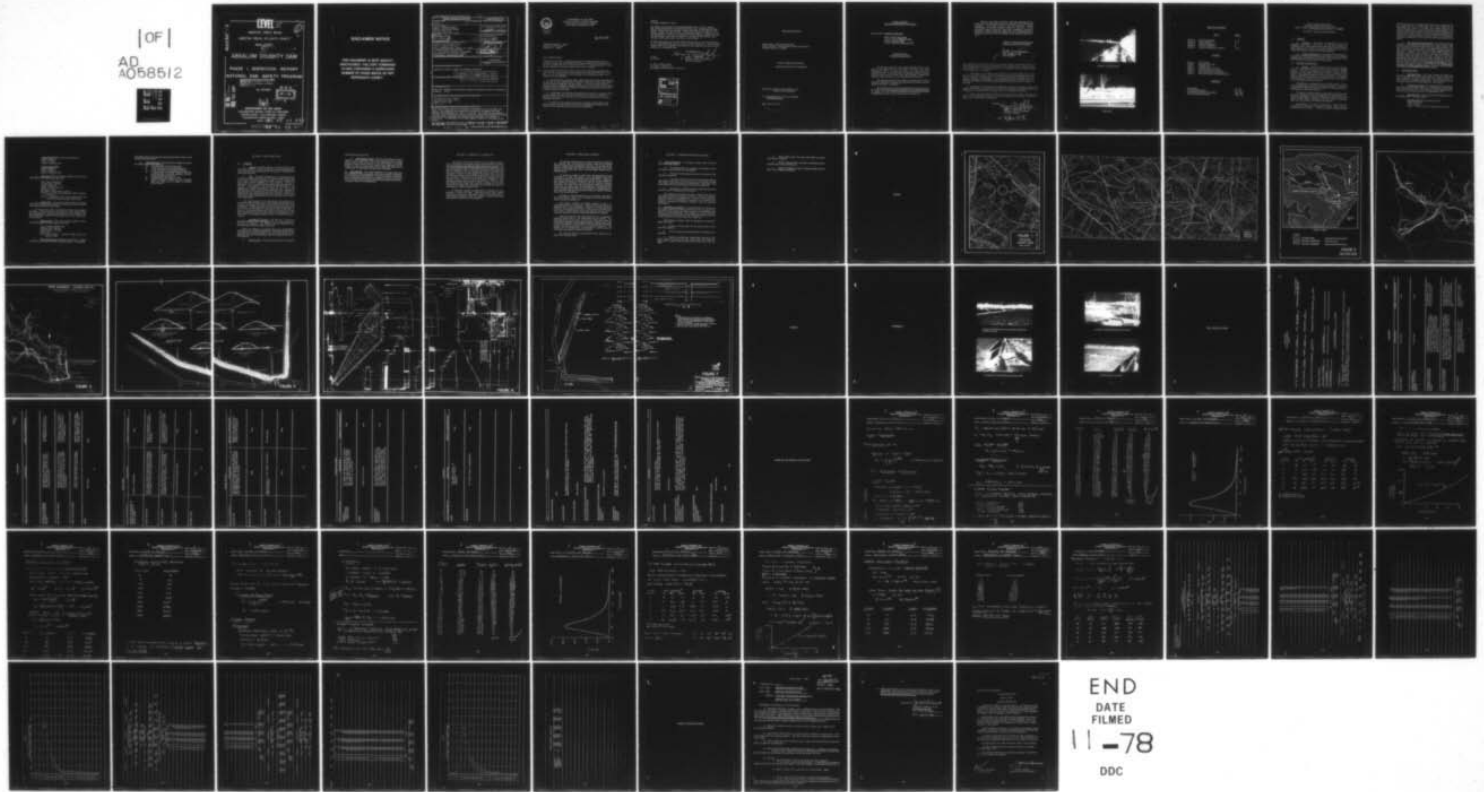
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NATIONAL DAM SAFETY PROGRAM. ABSALOM DOUGHTY DAM (NJ00080), ABS--ETC(U)
APR 78 J J WILLIAMS DACW61-78-C-0052

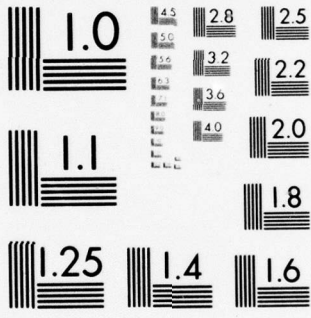
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ABSECON CREEK BASIN

ABSECON CREEK, ATLANTIC COUNTY

NEW JERSEY

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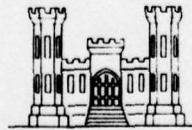
PHASE I INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

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DEPARTMENT OF THE ARMY
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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NJ00080	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program Absalom Doughty Dam Antlantic County, New Jersey		5. TYPE OF REPORT & PERIOD COVERED 9 FINAL rept.
7. AUTHOR(s) 10 John J. Williams P.E.		8. CONTRACT OR GRANT NUMBER(s) DACW61-78-C-0052
9. PERFORMING ORGANIZATION NAME AND ADDRESS O'Brien & Gere Engineers Inc. Justin & Courtney Division 1617 J.F.Kennedy Blvd., Phila., PA 19103		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 12 78p
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, Pennsylvania 19106		12. REPORT DATE 11 17 APR 1978
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18. SUPPLEMENTARY NOTES Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) National Dam Safety Program Dam Inspection Report Phase I Absalom Doughty Dam Dams - N.J.		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.		



IN REPLY REFER TO

NAPEN-D

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE-2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

16 JUN 1978

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Absalom Doughty Dam in Atlantic County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given on pages 1 and 2 of the report.

The inspection indicates the dam to be in poor condition primarily because of the concrete slab, slope protection on the upstream face of the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. Restoration of concrete slab, slope protection on the upstream face of the dam, if not already begun, should be initiated within three months after the date of approval of this report. If for any reason this restoration work is delayed, temporary protection, such as sand bagging and/or flexible liner installation, should be undertaken immediately to preclude possible failure of the dam.

b. A hydraulic and hydrologic investigation should be initiated within six months after the date of approval of this report to determine spillway modifications necessary to accommodate the spillway flood with adequate freeboard.

c. Within one year after the date of approval of this report, the trees and brush on the embankment should be removed and replaced with ground covers normally used on earth dam embankments.

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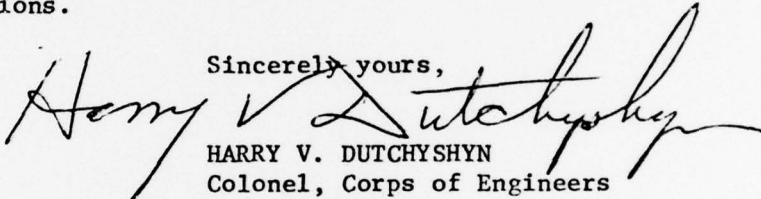
NAPEN-D

Honorable Brendan T. Byrne

Two copies of the report are being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Edwin B. Forsythe of the Second District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, thirty days after the date of this letter.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely yours,



HARRY V. DUTCHYSHYN
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Cy Furn: w/incl (dupe)
Mr. Dirk C. Hofman, P.E.
Department of Environmental Protection

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JUSTIFICATION		
DISTRIBUTION/AVAILABILITY CODES		
Dist.	AVAIL. and/or SPECIAL	
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ABSECON BAY BASIN

Name of Dam: Absalom Doughty Dam
County and State: Atlantic County, State of New Jersey
Inventory Number: NJ 00080

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared by: O'Brien & Gere Engineers, Inc.
Justin & Courtney Division

For: United States Army Corps of Engineers
Philadelphia District

Date: April 17, 1978

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Absalom Doughty Dam

State Located New Jersey
County Located Atlantic County
Stream Absecon Creek
Date of Inspection March 17, 1978

ASSESSMENT OF
GENERAL CONDITIONS

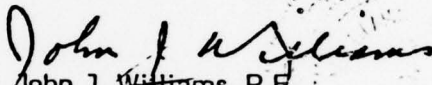
The physical condition of the Absalom Doughty Dam, at the time of the inspection, was very poor. The dam is an earth embankment with a concrete core wall and a steel sheet pile foundation cutoff. It is protected on the upstream slope and crest by concrete slabs, several of which have been displaced. Considerable erosion and some settlement of the embankment has occurred.

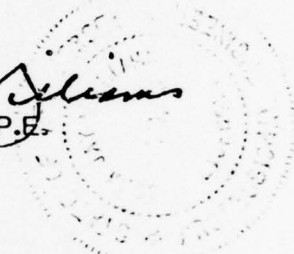
The Spillway Design Flood (SDF) of one-half the Probable Maximum Flood (PMF) overtops the embankment by 0.8foot, and the spillway, therefore, is inadequate.

On the basis of the visual examination of the area downstream of the dam and the Recommended Guidelines of the Safety Inspection of Dams, this dam should be placed in the Significant Hazard Classification, rather than the High Hazard Classification.

Plans for the repair of the dam have been developed by the owner, but this repair work was not completed at the time of the inspection. The eroded areas of the dam should be repaired immediately to prevent complete failure of the dam. If the permanent repairs cannot be completed immediately, temporary protective measures should be taken, such as the installation of a flexible liner, or placement of sandbags, on the upstream slope of the dam.

O'BRIEN & GERE ENGINEERS, INC.
JUSTIN & COURTNEY DIVISION

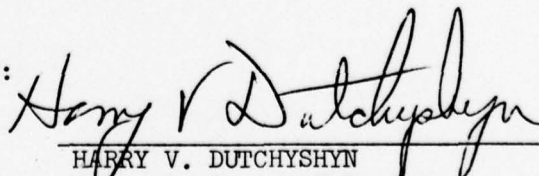

John J. Williams, P.E.
Vice President



The inspection indicates the dam to be in poor condition primarily because of considerable erosion and some settlement of the upstream face, concrete slab, slope protection. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

- a. Restoration of concrete slope protection of the upstream face of the dam, if not already begun, should be initiated within three months after the date of approval of this report. If for any reason this restoration work is delayed, temporary protection, such as sandbagging and/or flexible liner installation, should be undertaken immediately to preclude possible failure of the dam.
- b. A hydraulic and hydrologic investigation should be initiated within six months after date of approval of this report to determine spillway modifications necessary to accommodate the spillway flood with adequate freeboard.
- c. Within one year after the date of approval of this report the trees and brush on the embankment should be removed and replaced with ground covers normally used on earth dam embankments.

APPROVED:



HARRY V. DUTCHYSHYN
Colonel, Corps of Engineers
District Engineer

DATE:

16 June 1978



OVERALL VIEW OF DAM



SPILLWAY

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM ABSALOM DOUGHTY DAM ID# NJ00080

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with contract #DACW 61-78-C-0052 between O'Brien & Gere Engineers, Inc., Justin & Courtney Division, and the United States Army Corps of Engineers, Philadelphia District.

b. Purpose of Inspection - The purpose of this inspection is to evaluate the structural and hydraulic condition of the Absalom Doughty Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 PROJECT DESCRIPTION

a. General - Absalom Doughty Dam is an earth embankment dam with a concrete core wall and a steel sheet pile seepage barrier. The dam and spillway were raised in 1914. Records pertaining to the original construction were not available for our review. The upstream slope and crest is lined with concrete slabs about 6 inches thick, supported at the top and bottom of the slope by concrete beams. Portions of the downstream slope of the embankment are covered with trees and brush.

The spillway is an ungated concrete overflow section. Reservoir drain pipes are located at each end of the spillway. A concrete stilling basin is constructed below the spillway. Spillway discharge is monitored by a water-stage recorder.

The dam is located on Absecon Creek about one mile west of the City of Absecon, and 3.4 miles upstream from Absecon Bay. It is owned and operated by the City of Atlantic City, New Jersey and is used for water supply. Operation of the dam consists of pumping water from the reservoir, as needed for distribution.

Maintenance of the dam has been poor. Several areas of settlement and collapse of protective concrete slabs along the upstream face are visible. A chain link fence is being installed

around the reservoir. In August, 1975, Atlantic City contracted with the engineering firm of Remington and Boyd, Engineers, of Pennsauken, New Jersey, for a study on necessary repairs to the Absalom Doughty Dam. A permit application was subsequently filed with the New Jersey Department of Environmental Protection by Atlantic City in May, 1977, to cover the recommended repair work. The extent of proposed repairs is noted on Figure 7. At the date of inspection, the repair work noted in the May, 1977 application had not begun.

b. Size and Hazard Classification - The maximum storage capacity of the reservoir (to the crest of the dam) is about 2,100 acre-feet and the maximum height of the dam is about 18 feet. The dam is located at the upper limit of the Absecon Creek tidal marsh. This marsh is very wide and flat, and is sparsely populated along its perimeter. Failure of the structure would affect bridges and adjoining roads across Absecon Creek, and might cause flooding of buildings along the fringe of the marsh. Based on the visual examination, the potential for loss of human life appears to be small. Because of the low potential for loss of life in the event of a failure, the dam should be placed in the significant hazard category, rather than the high hazard category, as defined by the Recommended Guidelines for Safety Inspection of Dams. Therefore, the design flood is one-half of the Probable Maximum Flood (PMF).

1.3 PERTINENT DATA

a. Drainage Areas - The total drainage area above the Absalom Doughty Dam is 16.7 square miles. 8.7 square miles of the area is upstream of Doughty Pond Upper Dam, which is about 1.5 miles upstream of Absalom Doughty Dam. The remaining 8 square miles drains directly to the lower reservoir. (See Figure 2).

b. Discharge at Damsite The calculated spillway capacity with the reservoir at the crest of the embankment is about 3,700 cubic feet per second (cfs). The maximum average daily discharge, according to the records, was 295 cfs on September 6, 1935.

c. Reservoir Data - (from United States Geological Survey Quadrangle Sheet - 7.5 minute Series).

Normal Pool (Reservoir at spillway crest)
Length - 6,500 feet
Area - 225 acres
Volume - 750 acre-feet (from gaging station record)

Top of Dam (Reservoir at top of embankment)

Length - 9,000 feet

Area - 335 acres

Volume - 2,100 acre-feet

Maximum Pool ($\frac{1}{2}$ PMF)

Length - 9,500 feet

Area - 350 acres

Volume - 2,400 acre-feet

d. Dam Data (from the drawings supplied by New Jersey Department of Environmental Protection)

Type - earth embankment

Top elevation - 17.0 feet

Length - 2,850 feet

Height - 18 feet (maximum)

Top width - 8 feet

Side slopes - 2 horizontal : 1 vertical

Concrete core where the embankment height is greater than 9 feet

Cutoff - Interlocking steel sheet piling where the embankment height is greater than 10 feet

e. Outlet Data - A concrete intake structure is located about 300 feet south of the spillway. Drawings show a 42 inch wood outlet pipe connected to the structure.

A 30 inch drain pipe is constructed through each spillway abutment. Although the valve assemblies were not in place during the inspection, Mr. McLees, Superintendent of the Atlantic City Water Department, stated that the assemblies are now in place and are operational.

f. Spillway Data - (from the drawings supplied by New Jersey Department of Environmental Protection)

Type - concrete overflow weir

Length of weir - 110 feet

Crest elevation - 12.0 feet

Gates - none

Downstream channel - concrete stilling basin and Absecon Creek

g. Flood Elevations at the Dam (Local Datum) - Flood conditions for one-half of the PMF were investigated. The Doughty

Pond Upper Dam is overtopped by 0.8 feet, assuming no failure of the Doughty Pond Upper Dam.

h. Engineering Data - The information available for review of Absalom Doughty Dam included:

- 1) A location Plan of the dam (Figure 4)
- 2) A Plan and Sections of the dam (Figure 5)
- 3) A Plan and Section of the spillway (Figure 6)
- 4) A Plan Sections of proposed repairs to the dam by Remington and Boyd, Engineers of Pennsauken New Jersey (Figure 7)
- 5) Correspondence concerning the dam
- 6) Previous inspection reports by John N. Brooks (April 22, 1942) and by Joseph A. Dehnick (May 15, 1968)

SECTION 2 - VISUAL INSPECTION

2.1 FINDINGS

a. General - The field inspection of Absalom Doughty Dam took place on March 17, 1978. At the time of the inspection, about 3 to 4 inches of water was flowing over the spillway. No underwater areas were inspected.

b. Dam - The earth embankment is constructed primarily of sand, with some gravel and clay. The upstream face and the crest of the dam are covered with concrete slabs. Several of these slabs have either settled, collapsed, or been displaced. Erosion or settlement of up to 3 feet has occurred along the upstream face of the dam. The collapse of one slab about 600 feet south of the spillway has allowed wave action to erode the top 3 feet of the embankment to within 2 feet of the downstream face. Openings of about 18 inches by 8 inches were observed at the joints. Voids in the embankment were observed through these openings. Sand fill has recently been placed downstream of the toe of the dam in the vicinity of the pump station.

The central portion of the embankment has recently been cleared of brush and small trees. Heavy underbrush and trees up to 12 inches in diameter were noted on the slopes at both ends of the embankment. A 400-foot portion of the downstream slope of the dam on the north side terminates at a concrete wall about 4 feet high. A swale in the downstream slope, about 40 feet wide and up to 2.5 feet deep, was observed above the wall. South of the embankment, a 50-foot section of the adjacent ground is about 3 feet below the top of the dam.

c. Appurtenant Structures - The spillway is a concrete ungated overflow structure that appeared to be in good condition at the time of inspection. The adjoining concrete abutments have noticeable age cracks, but appear to be sound.

Below the spillway is a stilling basin and a United States Geological Survey Stream Gaging Station. Platforms are attached to each abutment for access to operate the reservoir drain pipes, but the operating assemblies for these pipes were not in place at the time of the inspection.

d. Reservoir Area - The reservoir perimeter is uninhabited

and the slopes are very mild.

e. Downstream Channel - Absecon Creek below the dam is subject to tidal variations. The stream discharges under a bridge located about 50 feet downstream of the stilling basin. The bridge opening is about 50 feet wide and 5 feet high. Downstream of the bridge is a wide, flat tidal marsh 2,000 to 4,000 feet wide which is virtually free of improvements except roads and bridges.

2.2 EVALUATION - The visual inspection of the site shows that the embankment and appurtenant structures are poorly maintained. The concrete slab slope protection is in need of repair, as evidenced by the embankment settlement and collapse of several of the slabs. Erosion at these areas is severe, and continued erosion could result in a complete failure of the embankment.

SECTION 3 - HYDROLOGY & HYDRAULICS

The Spillway Design Flood (SDF) used for Absalom Doughty Dam is one-half of the Probable Maximum Flood (PMF) according to the Recommended Guidelines for Safety Inspection of Dams. The SDF was calculated from the Probable Maximum Precipitation using standard reduction factors. PMF runoff increments were divided by two and applied to the Soil Conservation Service curvilinear unit hydrograph. Runoff into the Doughty Pond Upper Dam was routed through this reservoir before being combined with runoff into the lower reservoir. Routing of the combined inflow through the lower reservoir did not reduce the peak discharge of 11,000 cfs. This discharge would overtop the dam by about 0.8 feet. During $\frac{1}{2}$ PMF, the Doughty Pond Upper Dam would be overtopped by 1.8 feet. Failure of the Upper Dam would obviously increase the amount of overtopping of Absalom Doughty Dam.

A drawdown analysis was performed to evaluate the time necessary to lower the pool. With the starting water surface elevation at the spillway crest and no inflow, it is estimated that 6 days would be required to drain the reservoir. (See the Hydrologic and Hydraulic Calculations in the appendix).

SECTION 4 - STRUCTURAL STABILITY

The Absalom Doughty Dam is located on the gently undulating, but relatively flat and featureless eastern edge of the exposed Atlantic Coastal Plain physiographic province. To the east lie the shallow swamps, bays and lagoons which separate this "fast land" portion of the coastal plain from the barrier beach strands and the Atlantic Ocean.

As shown on Figure 3, both dams are physically set and constructed in sands and gravels of the Quaternary Cape May formation, as shown on the Geologic Map of New Jersey. Underlying this surficial unit, and in unconformable contact are the remnants of the Quaternary Bridgeton formation and the Tertiary Cohansey formation, the latter being the predominant substructure feature which dips very gently east and southeastward. All geologic units involved consist predominantly of cohesionless and erodible sediments with occasional clay units occurring as lenses of variable thickness and erratic areal distribution.

The dam is in Seismic Risk Zone 1 of the Seismic Zone Map of the United States. Due to the low height of the dam, the risk of seismic damage is probably low.

The present condition of Absalom Doughty is poor. A considerable amount of settlement or erosion has occurred along the upstream face of the embankment. Where the concrete slab slope protection has collapsed, the effects of the erosion or settlement are most severe. Strong westerly winds could generate waves of up to 3 feet that could wash away the cohesionless embankment material.

Where the concrete slab slope protection has not collapsed, additional undermining of the embankment may be hidden. The effectiveness of the concrete core and the steel sheet piles for embankment stabilization and seepage control is unknown, since they could not be observed. Some portions of the embankment are heavily covered with brush and trees up to 12 inches in diameter. The stability of the embankment is questionable in eroded areas, as evidenced by the physical condition of the dam.

The concrete spillway and abutment system appears to be stable and in good condition.

SECTION 5 - ASSESSMENT/REMEDIAL MEASURES

5.1 DAM ASSESSMENT - The Absalom Doughty Dam is deficient in the following respects:

- a. The embankment has undergone considerable erosion and some minor settlement near the spillway.
- b. The concrete slab slope protection on the upstream face has been undermined.
- c. The heavy growth of trees on the downstream slope is detrimental to the safety of the dam since the root systems increase the seepage potential through the embankment. High winds could uproot trees, thus removing large portions of the embankment.
- d. The spillway is unable to pass the spillway design flood ($\frac{1}{2}$ PMF) without overtopping the embankment.

The condition of the dam is very poor. Failure of the concrete slab slope protection has already occurred in a number of locations, creating the potential for rapid failure. For these reasons, temporary measures, such as sandbagging or installation of a flexible liner, should be considered if permanent measures cannot be completed immediately.

5.2 REMEDIAL MEASURES - The Superintendent of the Atlantic City Water Department has stated that the repair work specified in the study by Remington and Boyd, Engineers, of Pennsauken, New Jersey, is nearing completion. The remedial work was not inspected in conjunction with this report, and the following measures are based on the condition of the dam at the time of inspection.

The following measures could be considered for permanent repair of the dam:

- a. Remove concrete slabs on the upstream slope which have been displaced.
- b. Fill the eroded areas under the slabs with suitable earth materials.
- c. Replace concrete slabs. Graded filter material or filter fabric should be placed over the earth before the slabs are constructed. Expansive filler should be used in the joints of the new slabs.

d. Pump cement grout into areas where slabs are undermined but not displaced.

e. Remove trees and brush and replace with ground covers normally used on dam embankments.

f. Modify the spillway to pass the spillway design flood ($\frac{1}{2}$ PMF) with an adequate freeboard.

FIGURES

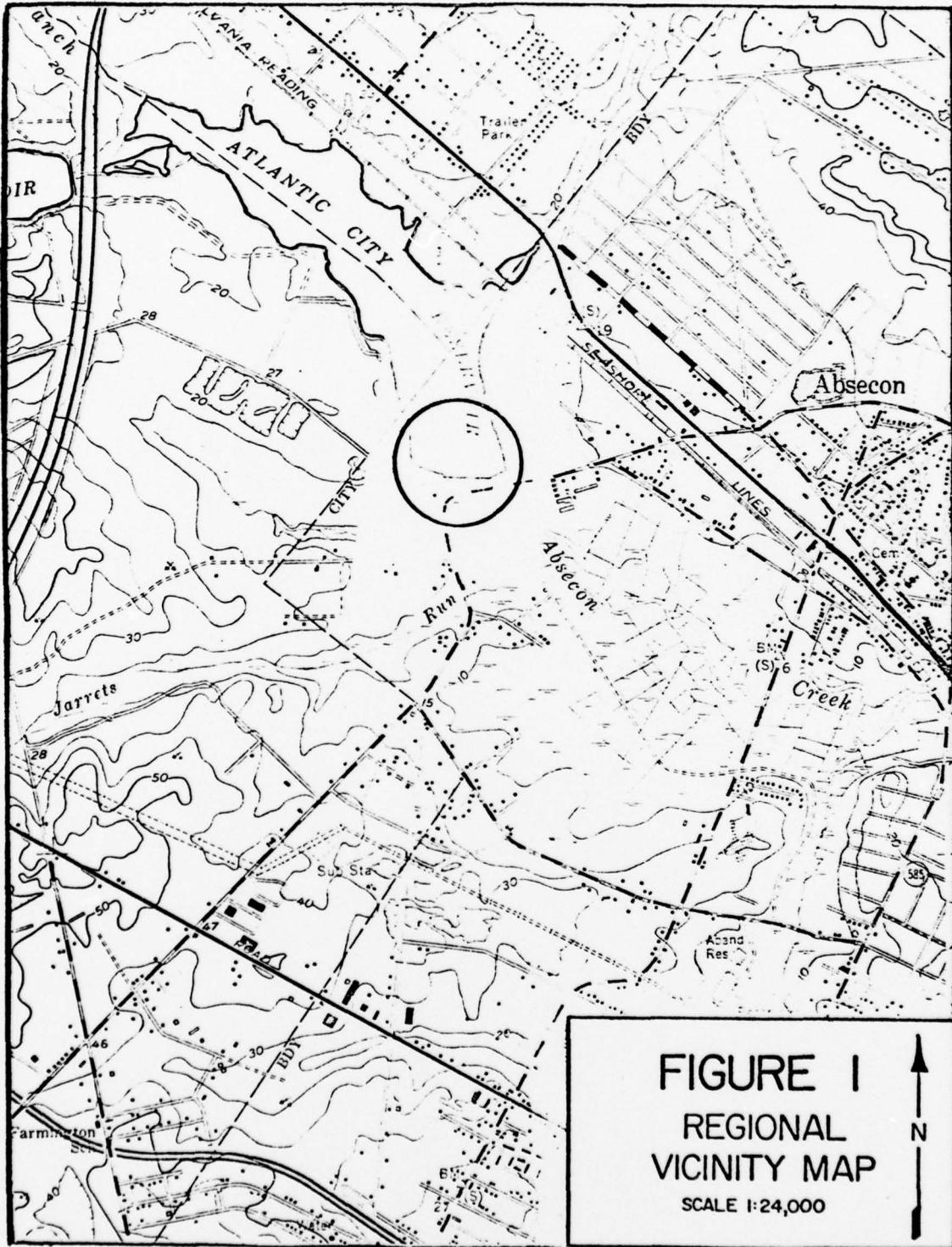
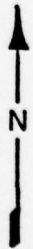
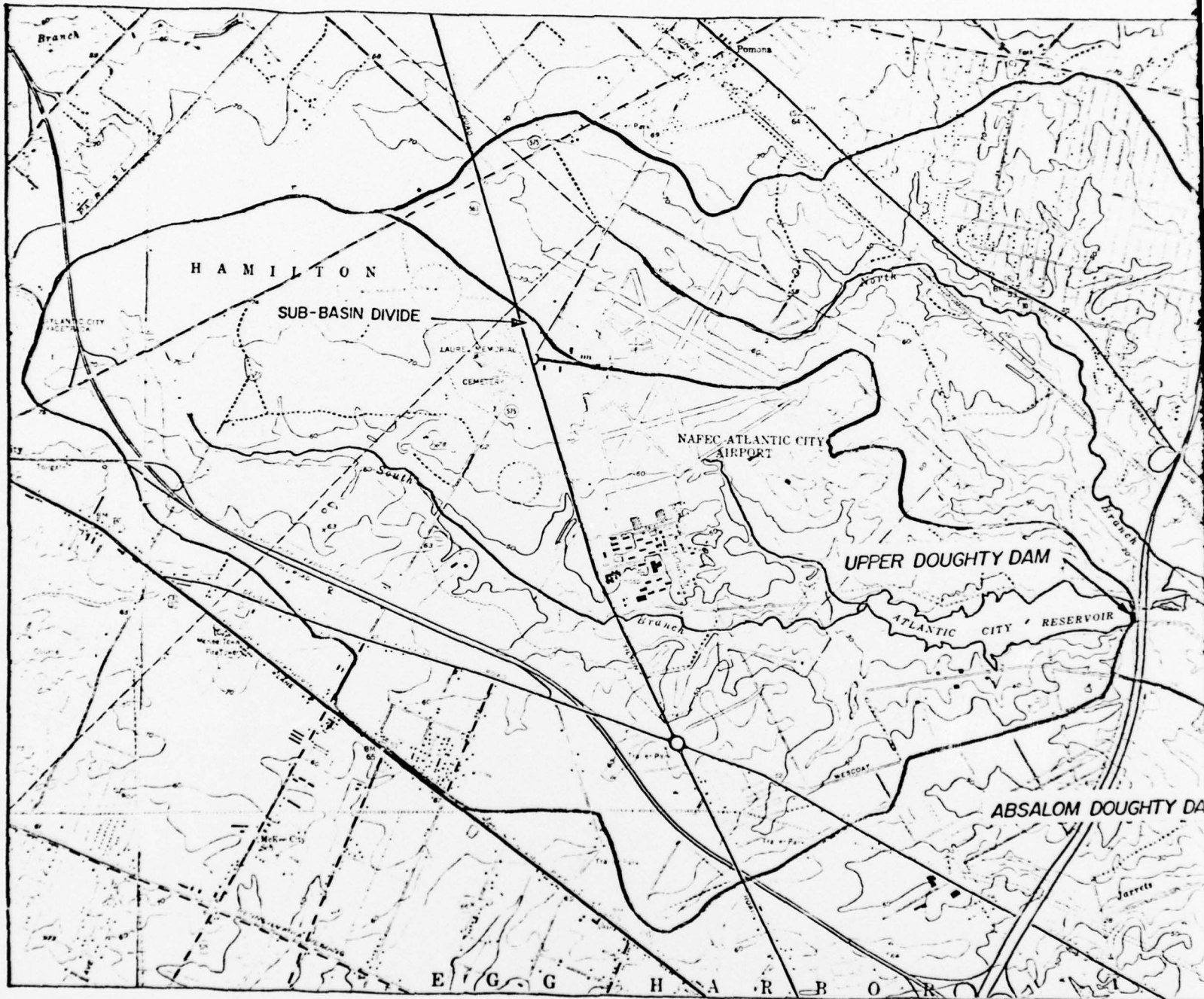


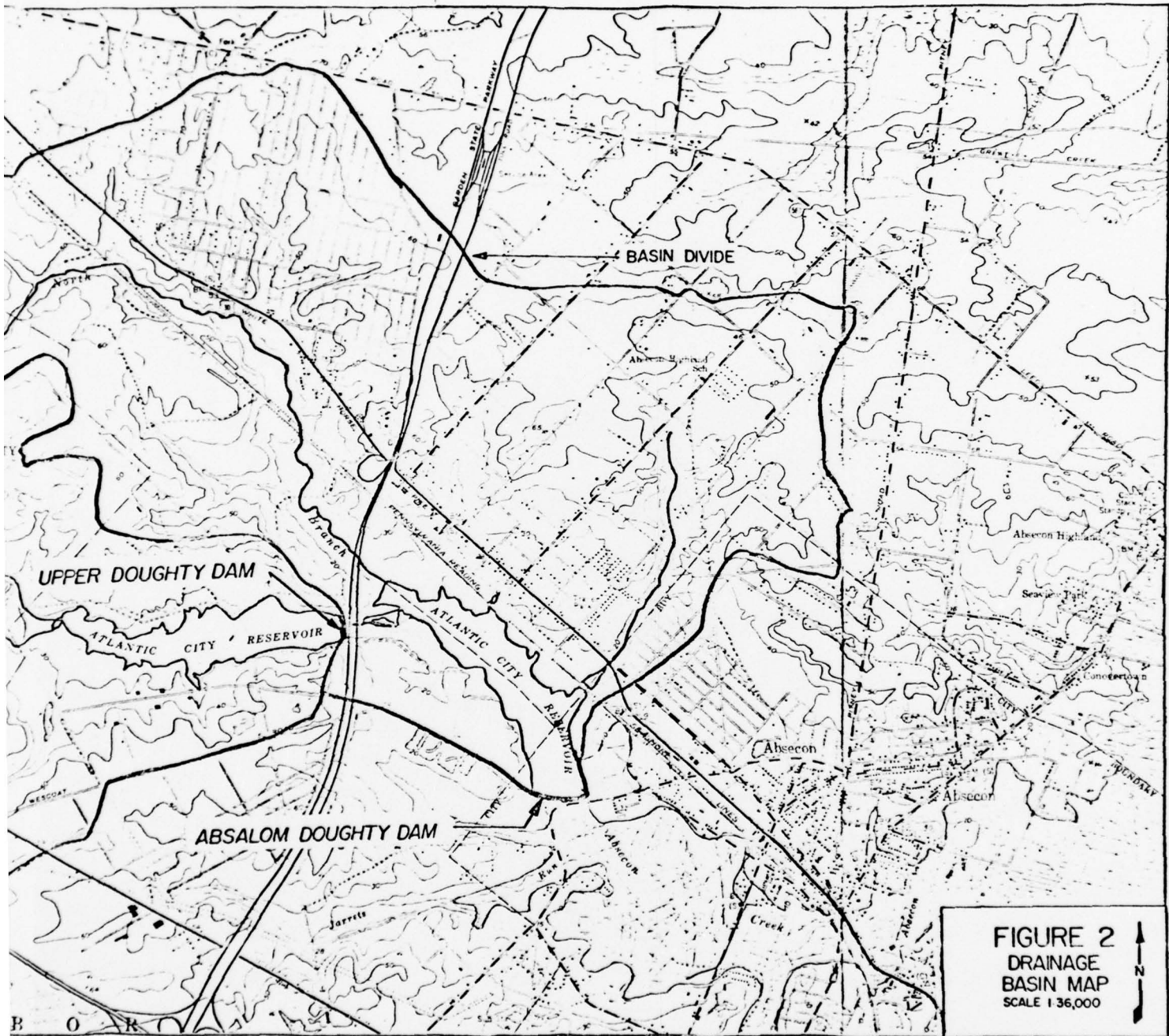
FIGURE I
 REGIONAL
 VICINITY MAP
 SCALE 1:24,000



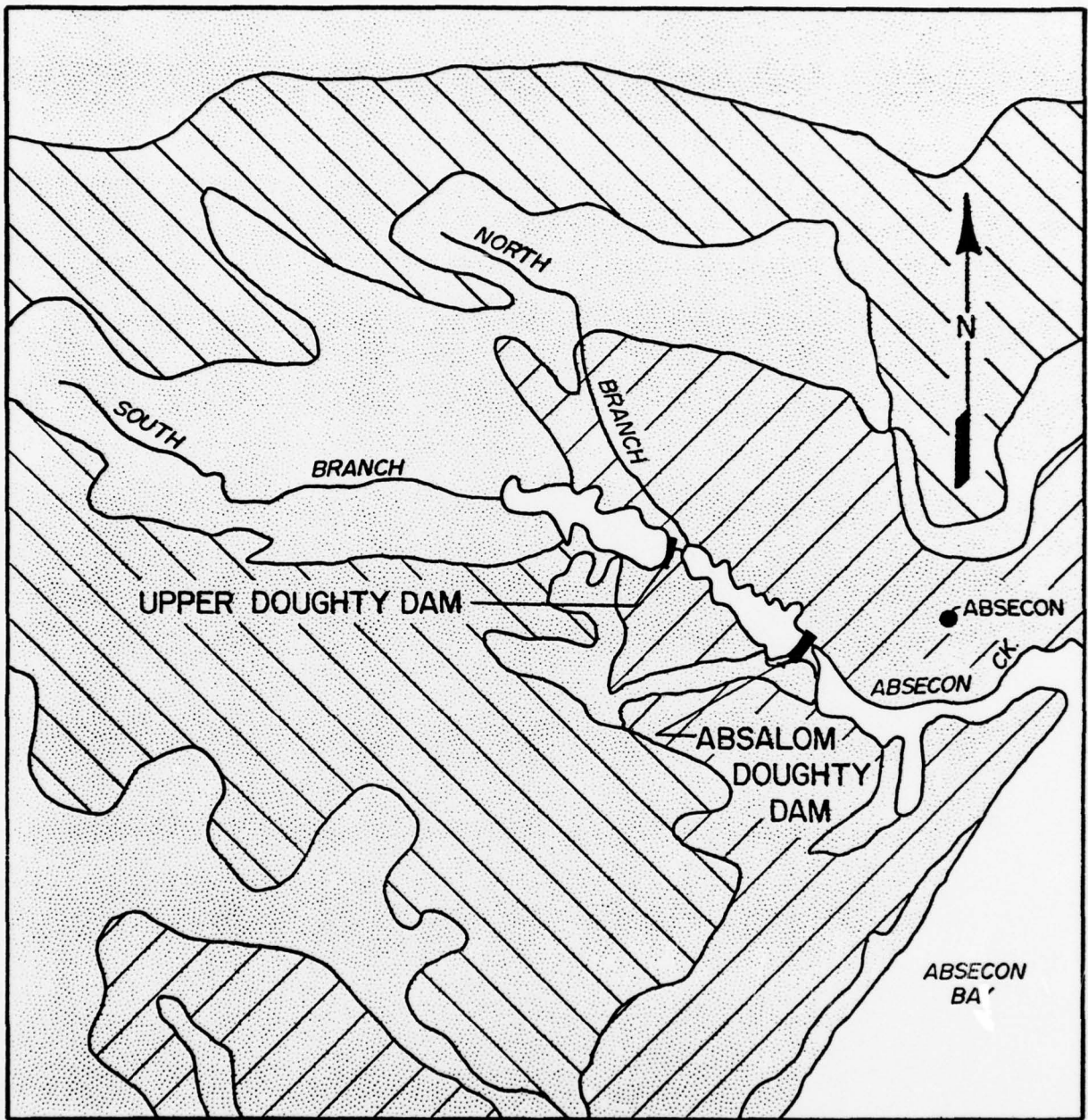


E I G G H A R B O R

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2



SCALE 1" = 1 MILE

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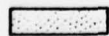
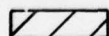
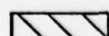
	COHANSEY SAND	Sand, with some clay and gravel.
	BRIDGETON FORMATION	Gravel and sand.
	CAPE MAY FORMATION	Gravel and sand with some clay.

FIGURE 3
GEOLOGIC MAP

MARTHA



WATER DEPARTMENT ATLANTIC CITY N.J.

LOCATION PLAN OF WATERSHED AND RESERVOIR (CITY POND) Scale 1"=100'

L Van Borden, Engineer and Supt

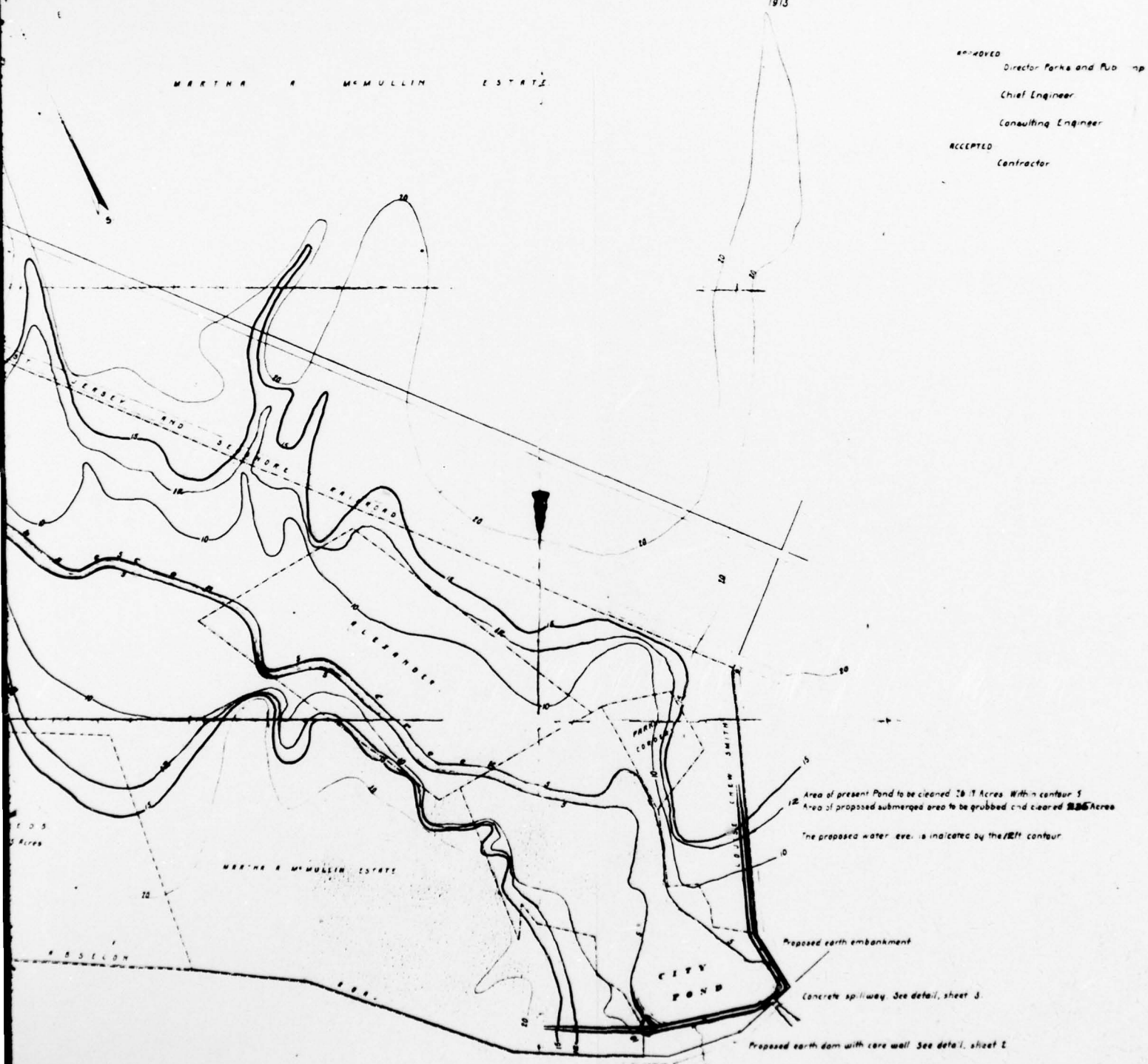
T Chaikley Hatten, Consulting Engineer

1913

MARTHA R. McMULLIN ESTATE

APPROVED
 Director Parks and Public Works
 Chief Engineer
 Consulting Engineer

ACCEPTED
 Contractor

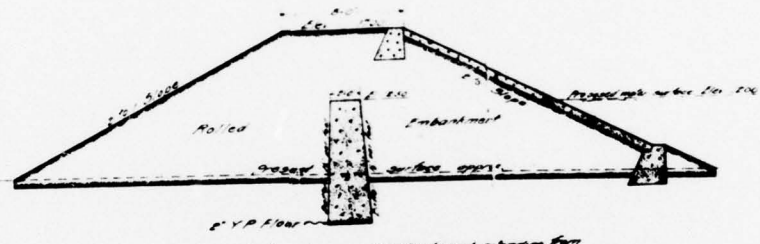
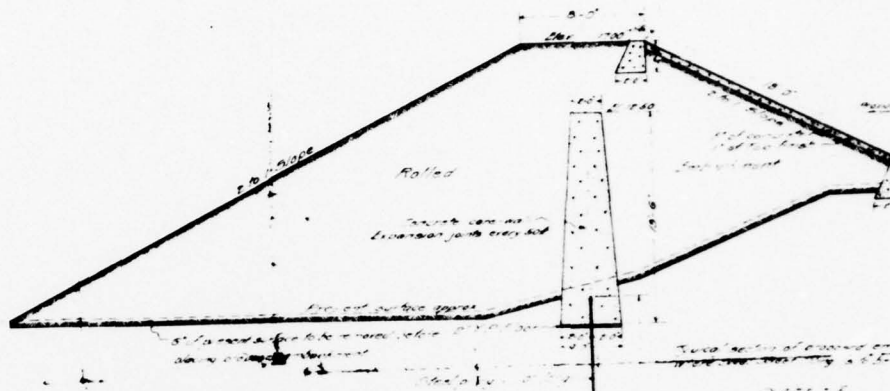


Area of present Pond to be cleaned 28.17 Acres Within contour 5
 Area of proposed submerged area to be grubbed and cleared 22.25 Acres
 The proposed water level is indicated by the 12ft contour

Proposed earth embankment
 Concrete spillway See detail, sheet 3
 Proposed earth dam with core wall See detail, sheet 2

FIGURE 4

J.

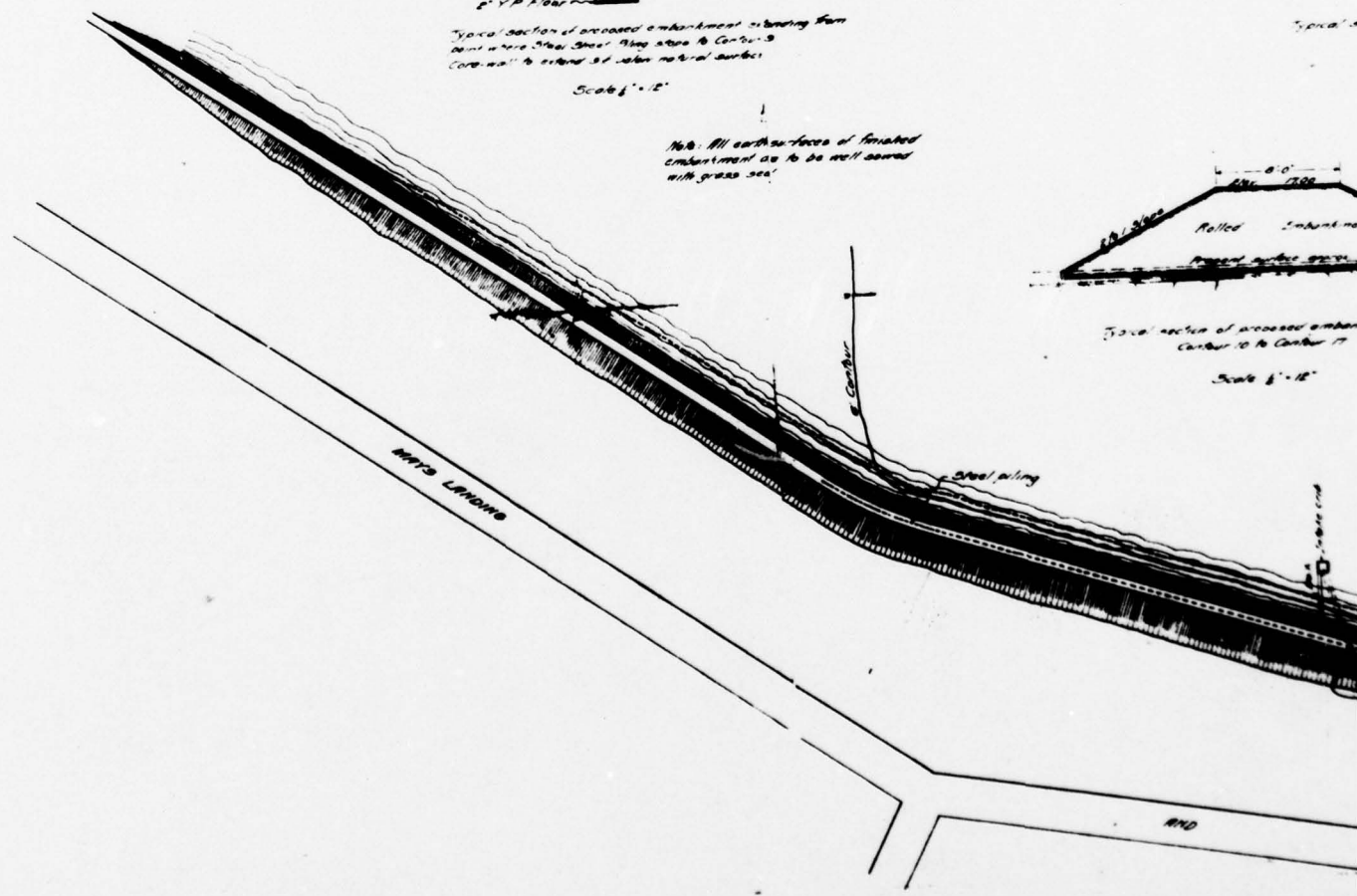


Typical section of processed embankment showing form built where Sheet Piles along to Center 9
 Core wall to extend 3' below natural surface
 Scale 1" = 12'

Note: All earth surfaces of finished embankment are to be well sowed with grass seed.



Typical section of processed embankment
 Center 10 to Center 17
 Scale 1" = 12'



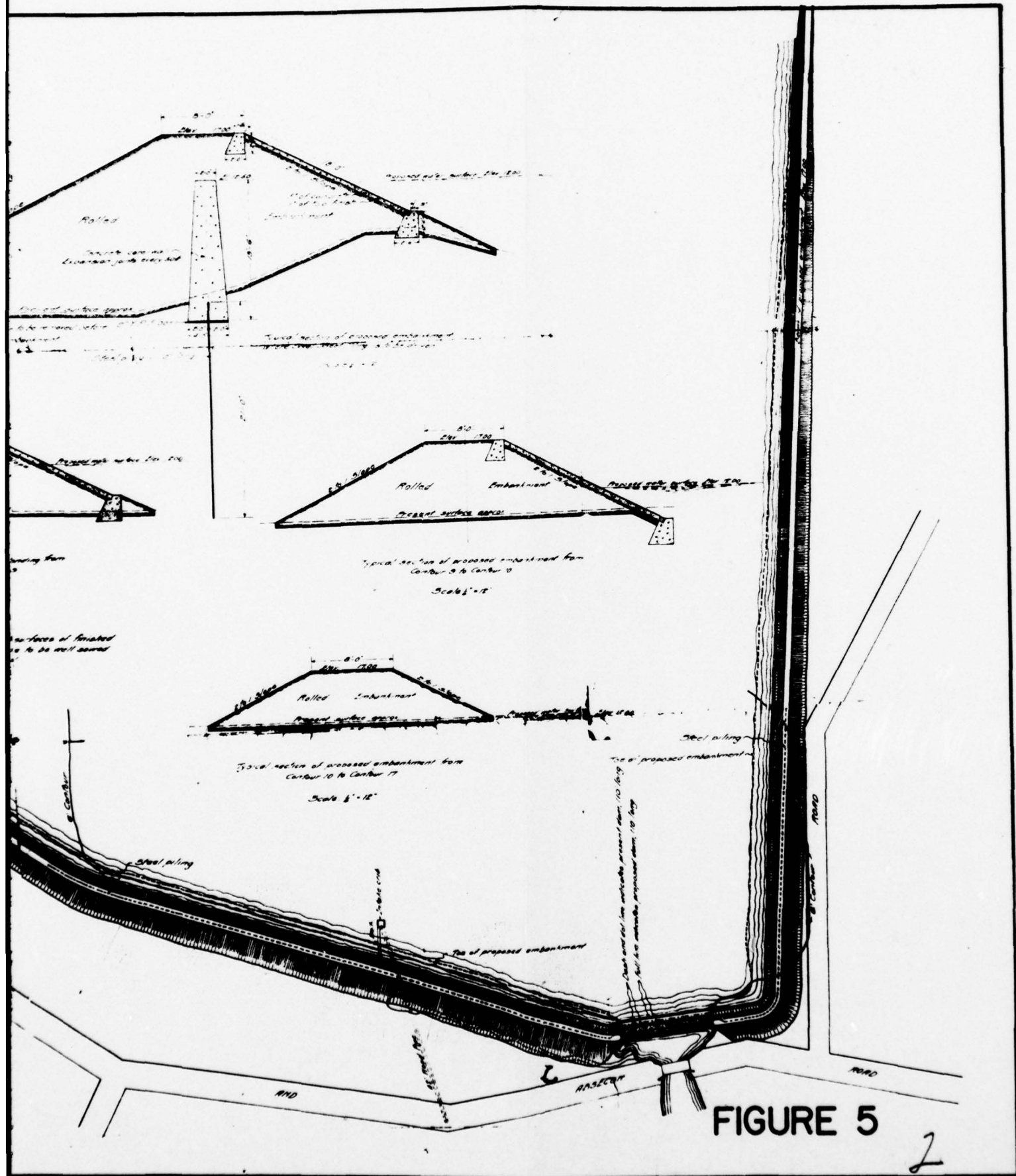
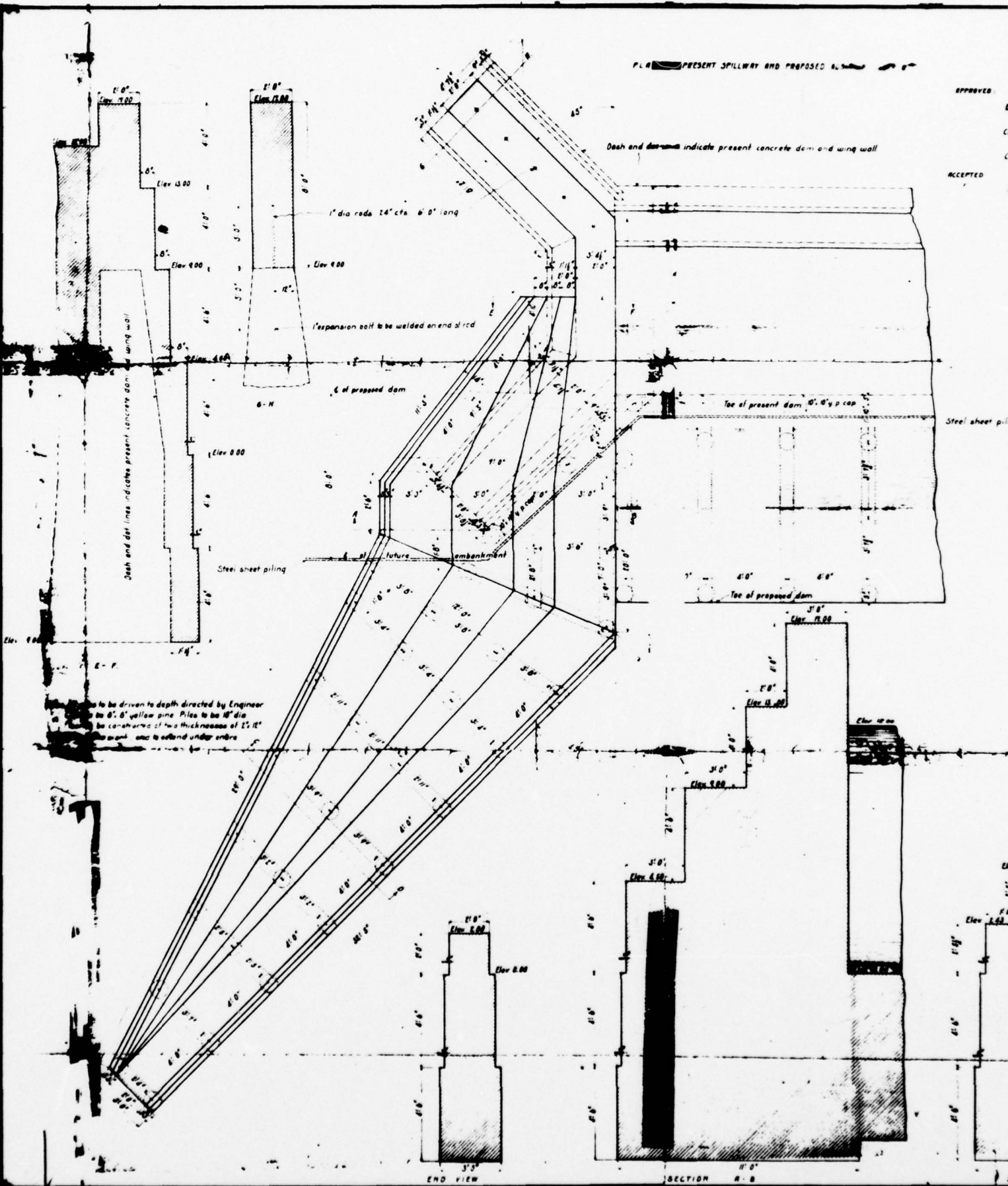


FIGURE 5

PLAN PRESENT SPILLWAY AND PROPOSED DAM

APPROVED

ACCEPTED



PROPOSED DAM

APPROVED

I. Van Alder, Engineer and Super

Director Parks and Public Imp.

Chief Engineer.

Consulting Engineer.

ACCEPTED

Contractor.

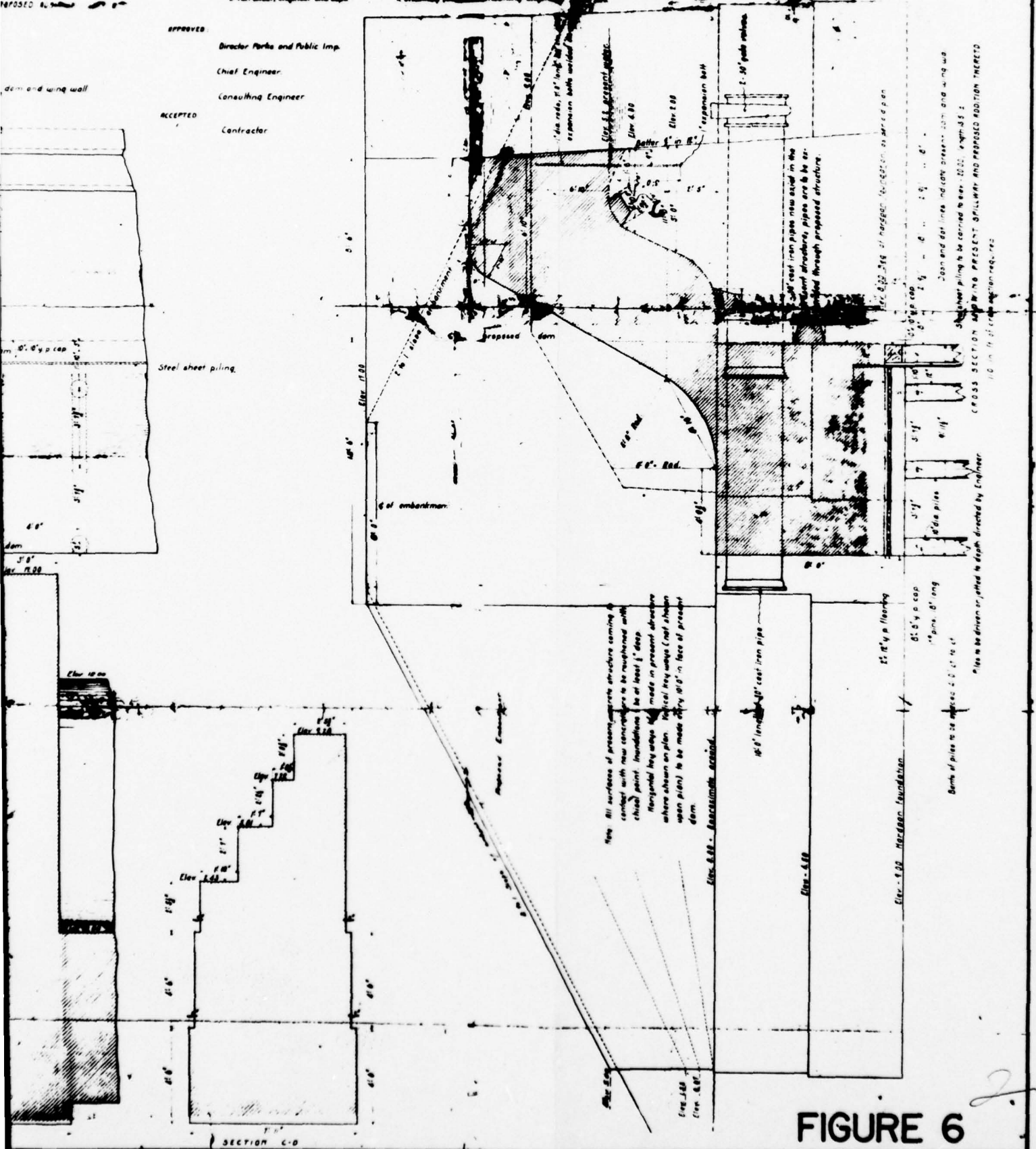
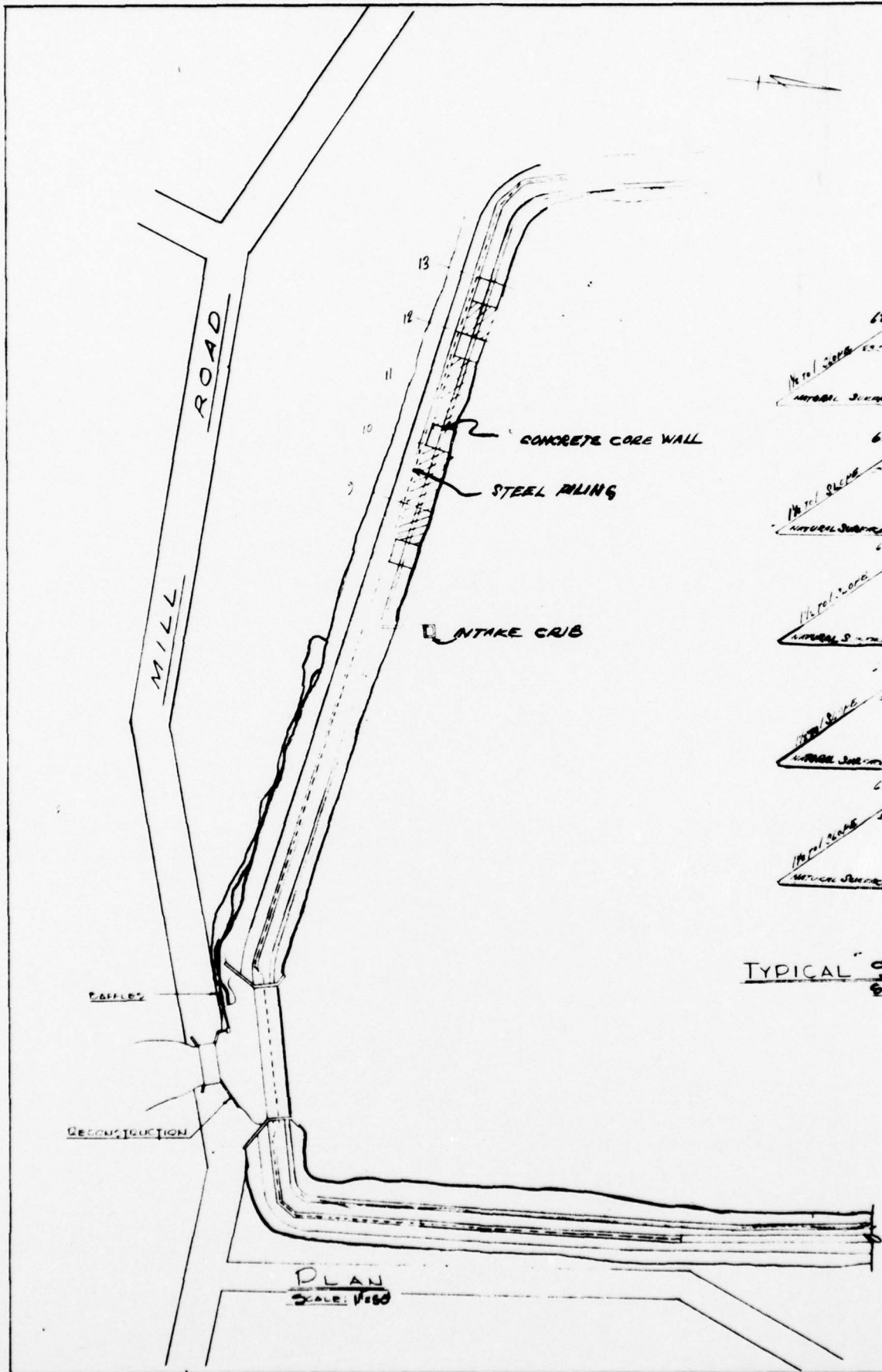


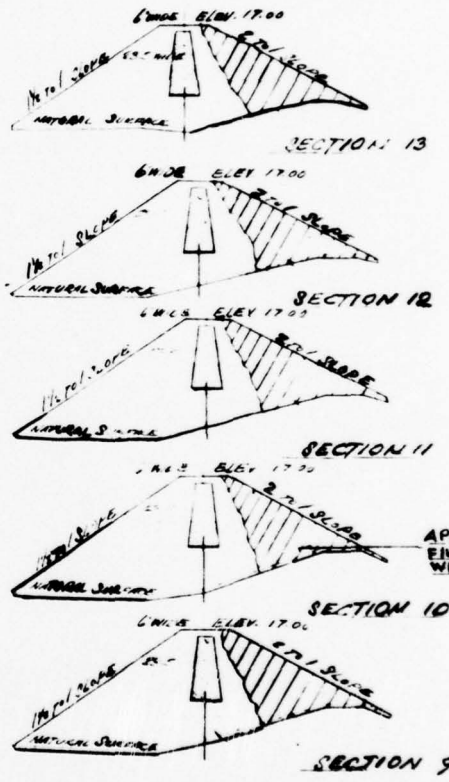
FIGURE 6

2

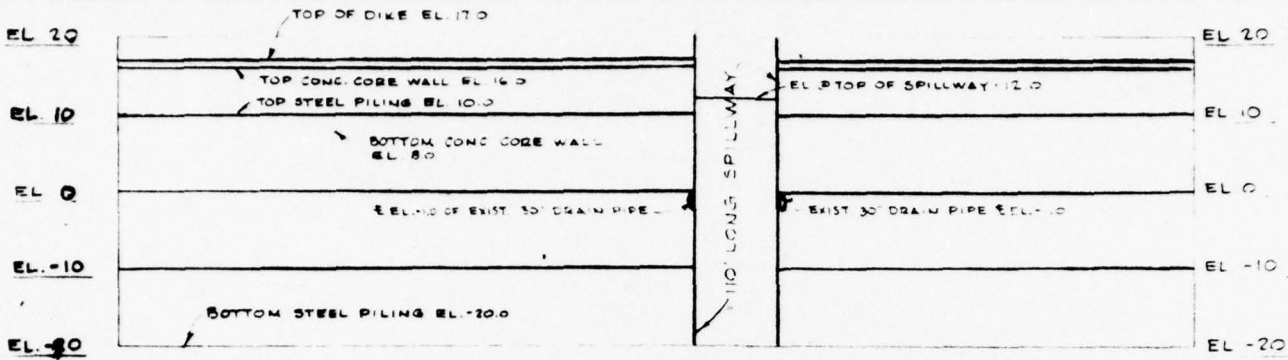


PLAN
SCALE: 1"=50'

EL. 20
EL. 10
EL. 0
EL. -10
EL. -20

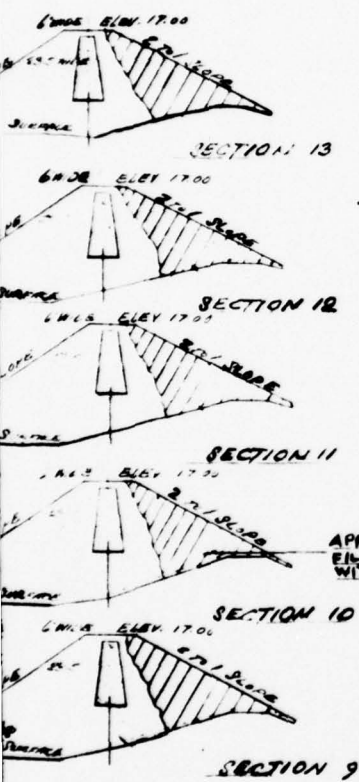


TYPICAL SECTION OF DIKE
SCALE: 1"=10'



LONGITUDINAL SECTION ALONG DIKE

SCALE: HORIZ 1" = 10'
VERT 1" = 10'



APPROXIMATE AREA OF FILL MATERIAL (SAND WITH CEMENT GROUTING)

NOTES:

1. DIKE REPAIRS ARE AS FOLLOWS: FILL MATERIAL; FIXING CONCRETE HOLES ON SLABS AND SLAB JOINTS; REPLACEMENT OF DISINTEGRATED CONCRETE INCLUDING GROUTING AND SLAB REPLACEMENT AS REQUIRED BY THE ENGINEER.
2. REHABILITATE DETEIORATED CONCRETE AT BAFFLE WALLS IN FRONT OF DAM AS REQUIRED.
3. RECONSTRUCT FALLEN BAFFLE WALL (20'-0").

SECTION OF DIKE

SCALE: 1" = 10'

248
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 Protection
 Div. Water Resources
 Sup. Water Control

FIGURE 7

REPAIRS TO DOUGHTY POND

REMINGTON & BOYD, ENGINEERS
 PENNSAUKEN, NEW JERSEY

RELATES TO WATER SUPPLY RESERVOIRS
 DOUGHTY POND & RUSHVILLE POND
 OF BOMBARDIER WATER FILTRATION PLANT
 CITY OF ASPENHURST CITY, ATLANTA, GA., N.J.

KENNETH R. REMINGTON
 LIC. NO. 6834

DATE: Oct. 1, 1978 JOB NO. 7000 DRAWING NO. A-210

APPENDIX

PHOTOGRAPHS



VIEW OF UPSTREAM FACE SHOWING AREAS OF SLOPE FAILURE



CLOSEUP OF UPSTREAM SLOPE FAILURE



CHANNEL DOWNSTREAM OF SPILLWAY



WATER SUPPLY INTAKE

FIELD INSPECTION REPORT

Check List
Visual Inspection
Phase 1

Name Dam Absalom Doughty Dam County Atlantic State New Jersey Coordinators New Jersey DEP Mr. Larry Woscyna

Date(s) Inspection 3/17/78 Weather Clear Temperature 30°

Pool Elevation at Time of Inspection 12.3 M.S.L. Tailwater at Time of Inspection --- M.S.L.

Inspection Personnel:

Mr. John J. Williams _____
Mr. Lee DeHeer _____
Mr. George Elias _____
Mr. David Campbell _____ Recorder

Accompanied by:

Mr. Anthony J. Iarrobino, Soils Engineer, Technical Engineering Division, U.S. Army Corps of Engineers,
New York Division
Col. Weinberg, Reserve Officer, U.S. Army Corps of Engineers, New York Division
Mr. Larry Woscyna, Civil Engineer, New Jersey Department of Environmental Protection

EMBANKMENT

WHEEL 1

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

SURFACE CRACKS

None Noted

None

UNUSUAL MOVEMENT OR
CRACKING AT OR BEYOND
THE TOE

None Noted

None

SLOUGHING OR EROSION OF
EMBANKMENT AND ABUTMENT
SLOPES

Local embankment erosion up to 3 feet was noted where the concrete slab slope protection has been dislodged. At one point, the remaining top width is less than 2 feet. An unknown amount of settlement and erosion has occurred where the slabs are intact.

The embankment is in poor condition and is in need of considerable repair.

VERTICAL AND HORIZONTAL
ALIGNMENT OF THE CREST

In the overbank section at the far right end of the dam is a 50-foot section where the embankment was removed or omitted. The ground elevation is about 3 feet below the top of dam. There is no channel below the opening.

Discharge through the opening would flow through a wooded area parallel to the dam and could cause erosion of the downstream toe.

RIPRAP FAILURES

Concrete slabs were used for slope protection. Several slabs have collapsed after considerable embankment settling.

The concrete slab slope protection is in need of repair.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
<p>JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAN</p>	<p>Settlement has occurred next to both spillway abutments. Concrete slabs for embankment protection are cracked, spalled and settled.</p>	<p>Considerable settlement of the embankments has occurred.</p>
<p>ANY NOTICEABLE SEEPAGE</p>	<p>Ponding of water up to 2 feet deep was observed downstream of the toe. Ponds extend from about 400 feet to the right of the spillway to the far right end of the embankment.</p>	<p>Ponding may be due to snowmelt, but should be observed over a period of time to determine if it is seepage water.</p>
<p>STAFF GAGE AND RECORDER</p>	<p>United States Geological Survey Gaging Station #01410500 (Water-Stage recorder).</p>	<p>Located next to stilling basin. May be inaccurate due to leakage through cracks in basin wall.</p>

DRAINS

None Noted

None

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Conduit is subsurface.	None
INTAKE STRUCTURE	Water supply intake structure and the walkway to the structure are badly cracked and spalled. Some lengths of the hand railing are missing.	Repair or replacement of the structure should be implemented as merited.
OUTLET STRUCTURE	Thirty-inch blowoff lines are located under the spillway near each abutment. The operating assemblies for these lines are not in place.	The operating assemblies should be permanently in place to allow emergency operation.
OUTLET CHANNEL	Same as spillway discharge channel.	None
EMERGENCY GATE	None	None

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	The floor of the spillway section appeared in good condition, though several inches of water was flowing across it. The concrete abutments were badly cracked and spalled.	Remedial work should be performed as necessary on the concrete of the abutments.
APPROACH CHANNEL	None	None
DISCHARGE CHANNEL	Absecon Creek is a tidal channel traversing a wide, flat marsh.	See next page.
BRIDGE AND PIERS	None	None

DOWNSTREAM CHANNEL

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

CONDITION
(OBSTRUCTIONS,
DEBRIS, ETC.)

The channel of Absecon Creek is incised in a wide, flat marshland above Absecon Bay. A bridge with an opening of about 250 square ft. is located about 100 ft. downstream of the spillway.

None

SLOPES

Slopes are very mild.

None

APPROXIMATE NO.
OF HOMES AND
POPULATION

The floodplain directly downstream is a very wide tidal marsh. Homes are located only along the perimeter of the marsh and most appear to be above expected flood levels. About 20 dwellings are located along the marsh within 2 miles of the dam.

None

RESERVOIR

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

SLOPES

Very gentle slopes. No structures along the reservoir.

None

SEDIMENTATION

No visible signs of sedimentation.

None

ITEM

REMARKS

MONITORING SYSTEMS

None.

MODIFICATIONS

The inspection report of 1942 indicated that gunitite repairs had recently been completed on the spillway and abutments.

HIGH POOL RECORDS

None available.

POST CONSTRUCTION ENGINEERING
STUDIES AND REPORTS

Inspection reports were filed by Joseph Dehnick in May of 1968, and by John Brooks in April, 1942. A study was prepared by Remington and Boyd Engineers, of Pennsauken, N.J., 1976. The study delineated proposed repairs to Absalom Doughty Dam and Upper Doughty Dam. Report information is included in the appendix.

PRIOR ACCIDENTS OR FAILURE OF DAM
DESCRIPTION
REPORTS

None known to have occurred.

MAINTENANCE
OPERATION
RECORDS

Average monthly water supply withdrawal rates from Water Resources Data for New Jersey, Part 1. Surface Water Records, 1974.

ITEM

REMARKS

DESIGN REPORTS

No design reports are available.
The only available design information was three drawings for the proposed increase in height to Absalom Doughty Dam, dated 1914.

GEOLOGY REPORTS

See Section 6.

DESIGN COMPUTATIONS
HYDROLOGY & HYDRAULICS
DAM STABILITY
SEEPAGE STUDIES

$\frac{1}{2}$ PMF - Inflows and outflow peaks - 11,000 cfs (5.8 feet above spillway crest). This discharge overtops the dam. 500 year flood - Doughty Pond Upper Dam overtops and Absalom Doughty Dam overtops if a failure of Doughty Pond Upper Dam is assumed. The safety of the dam is questionable, even for normal pool elevations. No seepage studies were made.

MATERIALS INVESTIGATIONS
BORING RECORDS
LABORATORY
FIELD

None

POST-CONSTRUCTION SURVEYS OF DAM

None Available

BORROW SOURCES.

Local

All

HYDROLOGIC AND HYDRAULIC CALCULATIONS

NAME OF CLIENT CORPS OF ENGINEERS
 PROJECT UPPER LOUGHRAN DAM

DRAINAGE AREA = 8.7 SQ. MI.

UNIT HYDROGRAPH

ESTIMATION OF T_c

BUREAU OF PUBLIC ROADS

$$T_c = \left(\frac{11.9 L^3}{H} \right)^{.385} \quad L = 4.55 \text{ MILES}, H = 50 \text{ FEET}$$

$T_c = \underline{3.31 \text{ HOURS}} = \underline{200 \text{ MINUTES}}$

UPLAND METHOD

OVERLAND

AVERAGE OVERLAND SLOPE = .4%

OVERLAND LENGTH = 4000 FEET

VELOCITY = .25 FPS

$T_{o1} = 4000 \text{ FEET} / .25 \text{ FPS} = 16,000 \text{ SEC} = 4.44 \text{ HOURS}$

CHANNEL LENGTH = 20,000 FEET

AVERAGE SLOPE = .0017

AVERAGE 'n' VALUE = .04

$R = 1.5 \text{ FEET} \quad \therefore V = \frac{1.49}{n} R^{2/3} S^{1/2} = 2.45 \text{ FPS}$

CHANNEL

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NAME OF CLIENT CORPS OF ENGRS.

COMP. BY DBC

PROJECT UPPER DOUGHERTY DAM

CHECKED BY LW

$$T_{t2} = 20,000 \text{ FEET} / 2.45 \text{ FPS} = 8160 \text{ SEC} \approx 2.27 \text{ HOURS}$$

$$T_c = T_{t1} + T_{t2} = 4.44 + 2.27 = 6.7 \text{ HOURS} \approx 400 \text{ MIN.}$$

USE UPLAND METHOD

$$T_c = 6.7 \text{ HOURS} \approx 400 \text{ MIN}$$

HYDROGRAPH PARAMETERS

$$T_p = D/2 + .6 T_c$$

$$D \approx .15 T_c \approx 1 \text{ HOUR OR } 60 \text{ MIN}$$

$$T_p = 30 + .6 \times 450 = 300 \text{ MINUTES}$$

$$Q_p = 484 A / T_p = 842 \text{ CFS}$$

RUNOFF CURVE NUMBER

SOIL IS PRIMARILY RESIDUAL SANDS & GRAVELS, EVIDENCE OF UNDERLYING HARDPAN. (SOIL GROUP B).

15%	IMPERVIOUS	95
5%	MARSH	85
20%	MEADOW (FAIR)	62
55%	WOODLAND (POOR)	63
5%	RESERVOIR	99

$$\begin{aligned} \text{AVERAGE CN} &= .15 \times 95 + .05 \times 85 + .20 \times 62 + .55 \times 63 + .05 \times 99 \\ &= \underline{\underline{71}} \end{aligned}$$

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NAME OF CLIENT CORPS OF ENGRS.
 PROJECT UPPER DUALITY DAM

<u>T/TP</u>	<u>H/RP</u>	<u>T (HOURS)</u>	<u>q₂ (CFS)</u>	<u>q (adjusted)</u>
0	0.00	0	0	0
.1	0.015	.5	13	13
.2	0.075	1.0	63	62
.3	0.16	1.5	135	133
.4	0.28	2.0	236	232
.5	0.43	2.5	362	356
.6	0.60	3.0	505	497
.7	0.77	3.5	648	638
.8	0.89	4.0	750	738
.9	0.97	4.5	817	804
1.0	1.00	5.0	842	829
1.1	0.98	5.5	825	812
1.2	0.92	6.0	775	763
1.3	0.84	6.5	707	696
1.4	0.75	7.0	632	622
1.5	0.66	7.5	556	547
1.6	0.56	8.0	472	465
1.8	0.42	9.0	354	348
2.0	0.32	10.0	269	265
2.2	0.24	11.0	202	199
2.4	0.18	12.0	152	150
2.6	0.13	13.0	109	107
2.8	0.098	14.0	83	82
3.0	0.075	15.0	63	62
3.5	0.036	17.5	30	30
4.0	0.018	20.0	15	15
4.5	0.009	22.5	8	8
5.0	0.004	25.0	3	3
5	0.00	27.5	0	0

1.016"

1"

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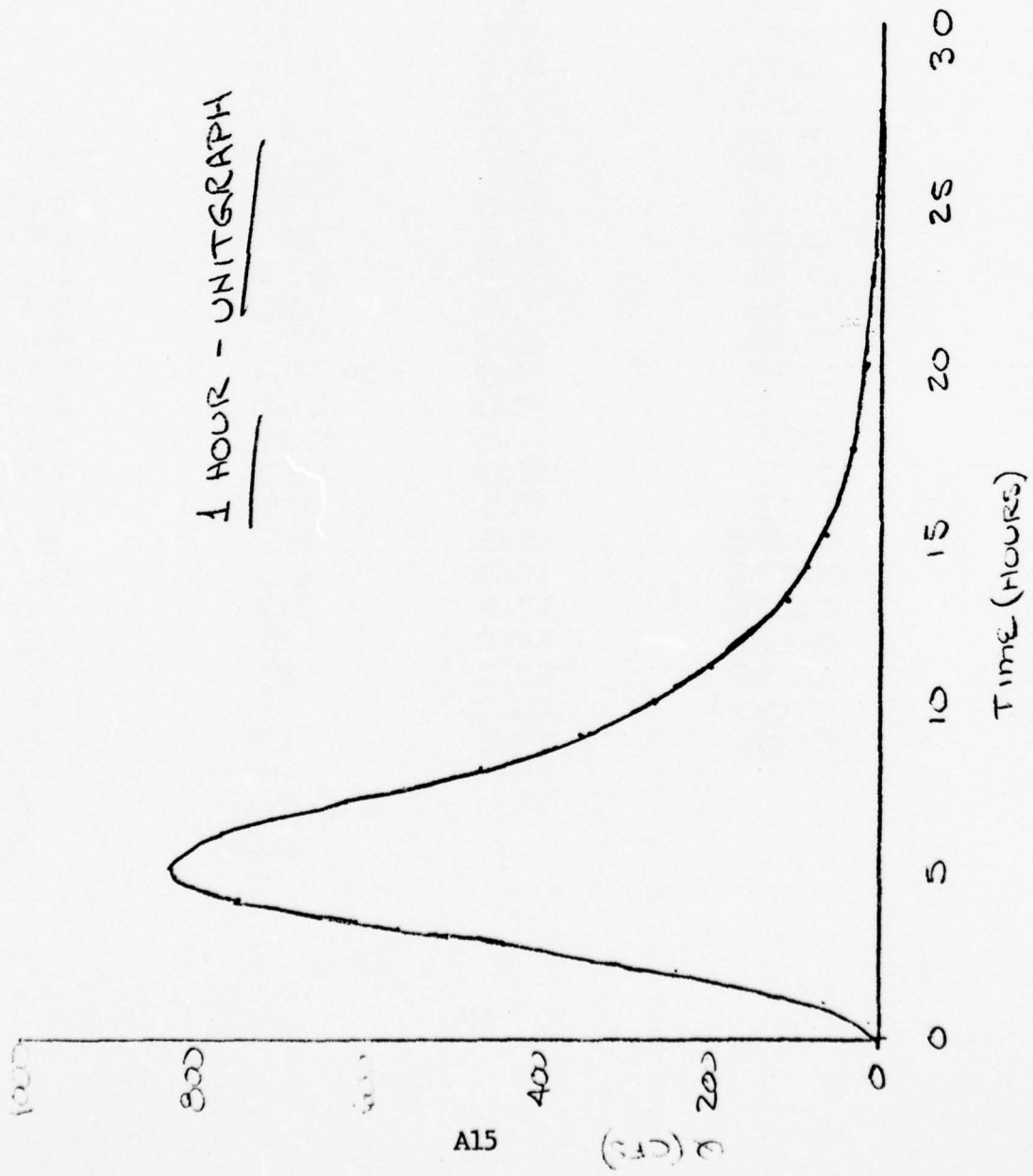
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NAME OF CLIENT CORPS OF ENGRS.

PROJECT UPPER DOUGLASS DAM



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PROJECT UPPER DOUGLASS DAM

CHECKED BY LW

1/2 PMP FLOOD COMPUTATION (UPPER DAM)

GHR PMP RAINFALL = 26"

20% REDUCTION FACTOR FOR PROBABLE MISALIGNMENT
 OF BASIN AND STORM DRAINAGE, SO -

ADJUSTED GHR PMP = 20.8"

TIME (HOURS)	PMP RAINFALL %	‡		RUNOFF		Losses	
		Σ	Incr.	Σ	Incr.	Σ	Incr.
1	8	1.7	1.7	.2	.2	1.5	1.5
2	9	3.5	1.8	1.1	.9	2.4	.9
3	11	5.8	2.3	2.7	1.6	3.1	.7
4	49	16.0	10.2	12.0	9.3	4.0	.9
5	15	19.1	3.1	14.9	2.9	4.2	.2 *
6	8	20.8	1.7	16.4	1.5	4.4	.2 *

‡ THIRD QUARTILE

* MINIMUM LOSS RATE

NAME OF CLIENT CORPS OF ENGINEERS

PROJECT UPPER DOUGHTY DAM

STAGE - STORAGE RELATION

AREA @ ELEV 25 = 130 ACRES } FROM USGS QUAD
AREA @ ELEV 30 = 300 ACRES }

ASSUME A LINEAR VARIATION IN SURFACE AREA
FROM ELEV 25 TO ELEV 30

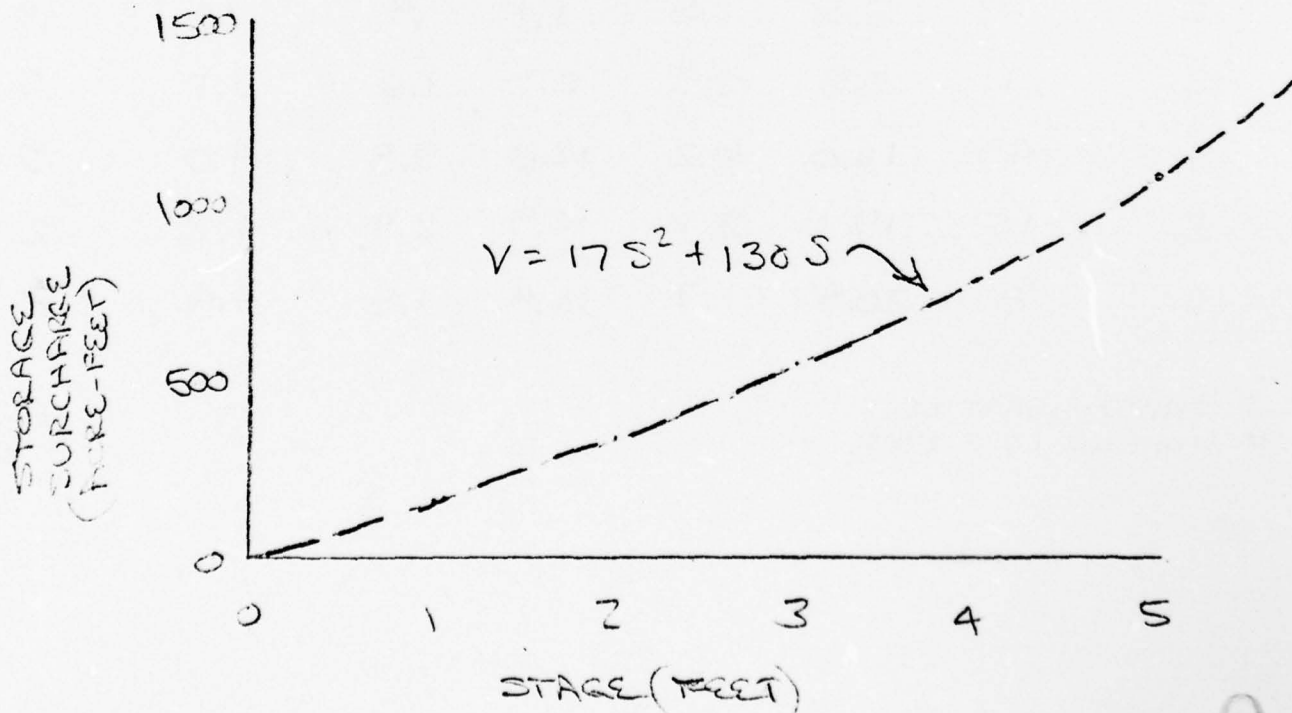
Let STAGE(S) = 0 @ ELEV = 25

$$A(0) = 130 \quad A(5) = 300$$

$$\therefore A = 34S + 130$$

$$V = \int_0^S (34S + 130) dS = 17S^2 + 130S + C$$

$$V(0) = 0 \quad \therefore C = 0$$



NAME OF CLIENT CORPS OF ENGINEERS

PROJECT UPPER DOUGHTY DAM

STAGE - DISCHARGE RELATION

OVERFLOW SPILLWAY (BROAD-CRESTED)

25' WIDE WITH 1' WIDE BRIDGE PIER

EFFECTIVE WIDTH = 24'

VERTICAL OPENING IS 2' TO BRIDGE GIRDERS

$$Q = CLH^{3/2} \quad C = 3.1 \quad L = 24' \quad Q = 74.4 H^{3/2}$$

FROM ELEV. 27' TO ELEV. 28' (PRESSURE FLOW)

$$Q = CA\sqrt{2gH} \quad C = .55$$

$$Q = .55 \times 2 \times 24 \times \sqrt{2g} \times \sqrt{H} = 211 \times H^{.5}$$

ABOVE ELEV. 28' PRESSURE FLOW AND WEIR FLOW ACROSS THE CREST OF DAM.

$$L = 750' \quad C = 3.0$$

$$Q = CLH^{3/2} = 2250 H^{3/2}$$

STAGE	DISCHARGE	STAGE	DISCHARGE
0	0	3.0	298
.5	26	4.0	2615
1.0	74	5.0	6786
1.5	137	6.0	12160
2.0	210	7.0	18520

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PROJECT UPPER DAUGHTY DAM

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STORAGE - DISCHARGE RELATION
(HEC-1 INPUT)

STORAGE	DISCHARGE
0	0
70	26
147	74
233	137
326	210
540	298
700	2615
1050	6786
1390	12160
1740	18520

1/2 FIMF PEAK DISCHARGE FROM RESERVOIR IS ABOUT 5800CFS
OF A STAGE OF 4.8 FEET (1.8 FEET ABOVE THE
TOP OF DAM).

NAME OF CLIENT CORPS OF ENGRS

PROJECT ABSELEM DOUGHTY DAM

DRAINAGE AREA = 16.7 SQ. MI.

3.0 DIRECTLY TO ABSELEM DOUGHTY

3.7 THROUGH UPPER DOUGHTY POND (PP. 1-9)

ESTIMATION OF T_c FOR DIRECT FLOW TO ABSELEM DOUGHTY POND.

BUREAU OF PUBLIC ROADS

$$T_c = \left(\frac{11.9 L^3}{H} \right)^{.385}$$

$L = 4.92$ MILES $H = 63$ FEET

$T_c = 3.32$ HOURS

UPLAND METHOD

(OVERLAND)

AVERAGE OVERLAND SLOPE $\approx .27\%$

OVERLAND LENGTH = 5000 FEET

VELOCITY $\approx .25$ FPS

$T_{L_1} = 5000 / .25 \text{ FPS} = 20000 \text{ sec} = 5.55 \text{ HOURS}$

NAME OF CLIENT _____

DATE _____

PROJECT _____

COMP. BY _____

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(CHANNEL)

CHANNEL LENGTH \approx 21000 FEET

AVERAGE SLOPE \approx .00224

AVERAGE 'n' VALUE \approx .05

R \approx 3 FEET

$$V = \frac{1.49}{n} R^{2/3} S^{1/2} = 2.95 \text{ FPS}$$

$$T_{t_2} = 21000 \text{ FEET} / 2.95 \text{ FPS} = 7120 \text{ SEC} \approx 1.95 \text{ HRS.}$$

USE
OVERLAND

$$T_c = T_{t_1} + T_{t_2} = \underline{7.5 \text{ HOURS}}$$

$$\text{USE } D = \underline{1 \text{ HOUR}}$$

$$T_p = D/2 + .6 \times T_c$$

$$T_p = .5 + .6 \times 7.5 = 5 \text{ HOURS.}$$

$$Q_p = 484 A / T_p = 774.4 \text{ CFS}$$

RUNOFF CURVE NUMBER

SOIL IS PRIMARILY RESIDUAL SANDS & GRAVELS, EVIDENCE OF UNDERLYING HARDPAN. (SOIL GROUP B)

	CN
50% SFD (MEDIUM DENSITY)	80
5% RESERVOIR	99
45% WOODS & MEADOW (FAIR)	60

$$\bar{CN} = .5 \times 80 + .05 \times 99 + .45 \times 60 = \underline{\underline{72}}$$

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NAME OF CLIENT CORPS OF ENGRS

PROJECT ABSOLEM DEUGHTY DAM

<u>T/TP</u>	<u>g/gp</u>	<u>T (Hours)</u>	<u>g (cfs)</u>	<u>g (adjusted)</u>
0	.00	0	0	0
.1	.015	.5	11	11
.2	.075	1.0	58	57
.3	.16	1.5	123	122
.4	.28	2.0	216	214
.5	.43	2.5	332	328
.6	.60	3.0	464	458
.7	.77	3.5	596	588
.8	.89	4.0	689	680
.9	.97	4.5	751	741
1.0	1.00	5.0	774	764
1.1	.98	5.5	758	749
1.2	.92	6.0	712	703
1.3	.84	6.5	650	642
1.4	.75	7.0	580	573
1.5	.66	7.5	511	504
1.6	.56	8.0	433	428
1.8	.42	9.0	325	321
2.0	.32	10.0	247	244
2.2	.24	11.0	185	183
2.4	.18	12.0	139	137
2.6	.13	13.0	100	99
2.8	.098	14.0	75	74
3.0	.075	15.0	58	57
3.5	.036	17.5	27	27
4.0	.018	20.0	13	13
4.5	.009	22.5	6	6
5.0	.004	25.0	3	3
5.5	.00	27.5	0	0
			1.013"	1"

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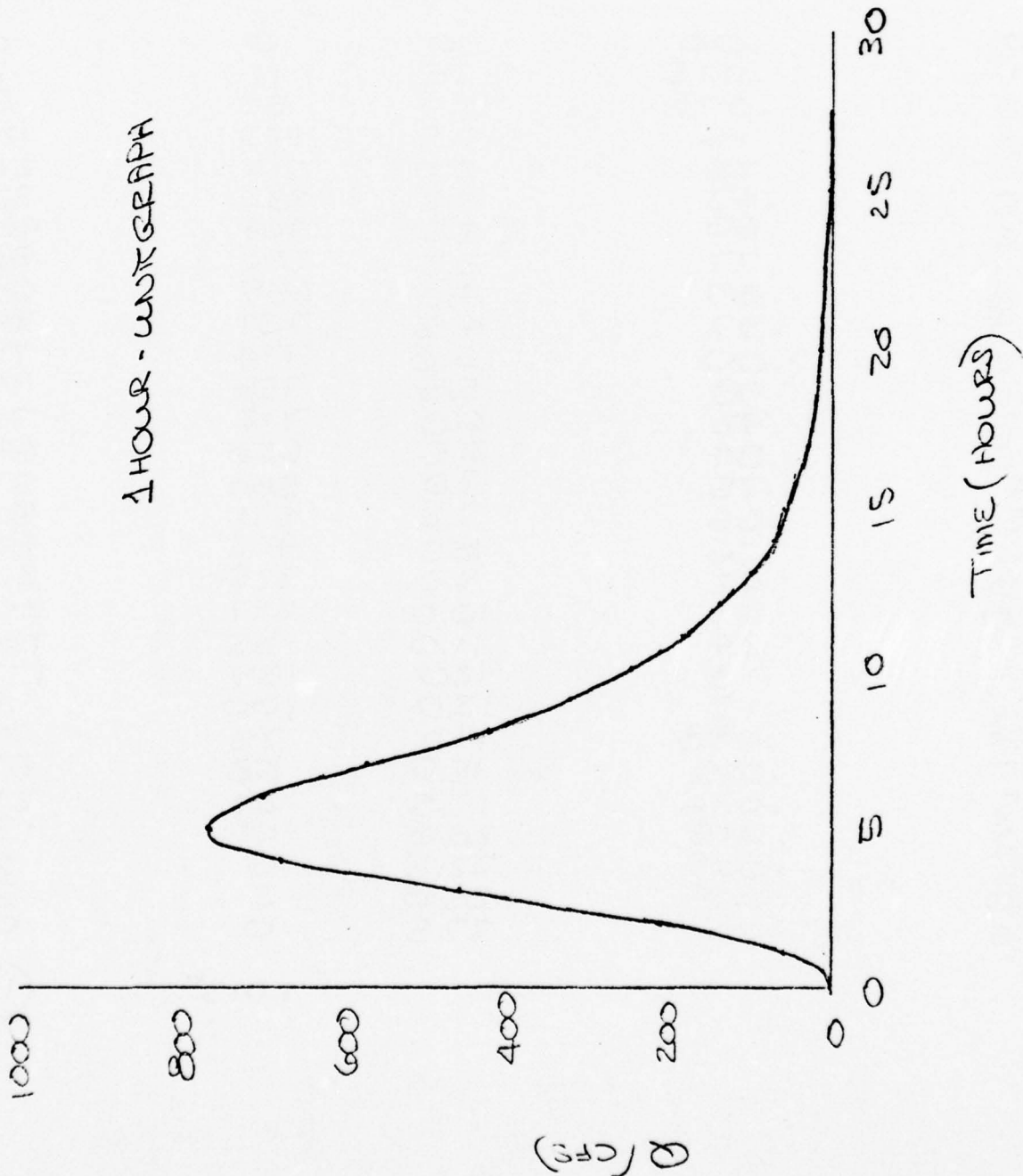
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DATE 3/24/75

PROJECT ABSOLEN DOUGHTY DAM

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NAME OF CLIENT CORPS OF ENGINEERS
 PROJECT ABSALOM DOUGHTY DAM

1/2 PMF FLOOD COMPUTATION (LOWER DAM)

6HR PMP RAINFALL = 26"

20% REDUCTION FACTOR FOR PROBABLE MISALIGNMENT
 OF BASIN AND STORM ISONYETALS, SO -
 ADJUSTED 6HR PMP = 20.8"

TIME (HOURS)	PMP RAINFALL %	PMP RAINFALL [#]		RUNOFF		LOSSES	
		Σ	Incr.	Σ	Incr.	Σ	Incr.
1	8	1.7	1.7	.2	.2	1.5	1.5
2	9	3.5	1.8	1.1	.9	2.4	.9
3	11	5.8	2.3	2.8	1.7	3.0	.6
4	49	16.0	10.2	12.1	9.3	3.9	.9
5	15	19.1	3.1	15.0	2.9	4.1	.2*
6	8	20.8	1.7	16.5	1.5	4.3	.2*

THIRD QUARTILE
 * MINIMUM LOSS RATE

HOURLY PMP RUNOFF INCREMENTS	.2"	.9"	1.7"	9.3"	2.9"	1.5"
HOURLY <u>1/2 PMP</u> " "	.1"	.45"	.85"	4.65"	1.45"	.75"

NAME OF CLIENT CORPS OF ENGRS
 PROJECT ARSALOM DOUGHTY DAM

STAGE - STORAGE RELATION

AREA @ ELEV. 9.0 \approx 160 ACRES
 AREA @ ELEV. 20.0 \approx 400 ACRES } *
 *(FROM USGS QUAD)

ASSUME A LINEAR VARIATION IN SURFACE AREA FROM ELEV. 9 TO ELEV. 20.

$$A(9) = 160 \quad \& \quad A(20) = 400$$

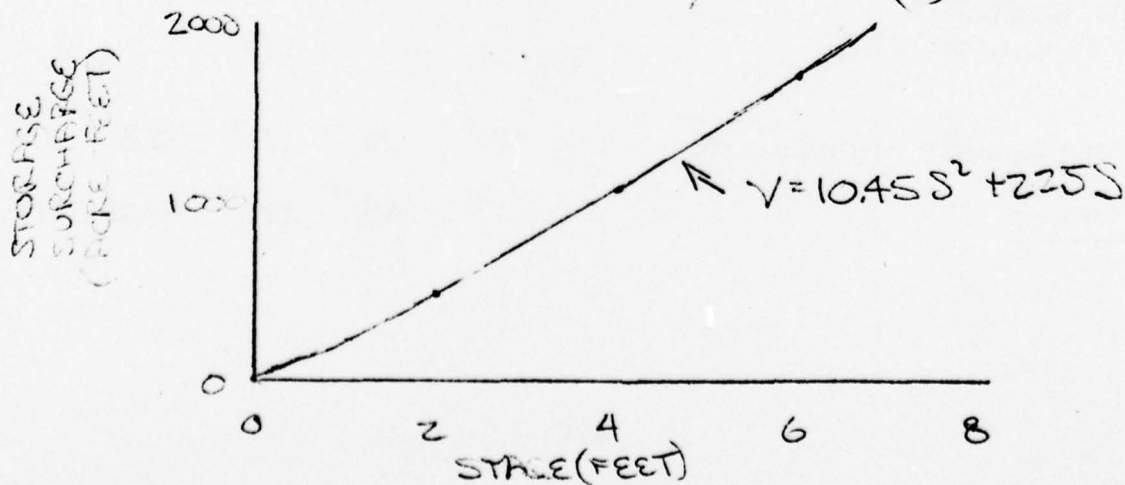
$$\therefore A = 21.8Y - 36 \quad \& \quad A(12) = 225$$

Let Stage (S) = 0 @ Y = 12

$$A(0) = 225 \quad \& \quad A(8) = 400$$

$$\therefore A = 21.9S + 225 \quad \& \quad V = \int_0^S (21.9S + 225) dS$$

$$V = 10.45S^2 + 225S + C \quad V(0) = 0 \quad \therefore C = 0$$



NAME OF CLIENT CORPS OF ENGRS.

DATE 3/25/78

PROJECT ABSOLEN DOUGHTY DAM

COMP. BY DBC

CHECKED BY LW

STAGE - DISCHARGE RELATION

OVERFLOW SPILLWAY (BROAD CRESTED)

110' WIDE

$$Q = CLH^{3/2} \quad C = 3.1 \quad L = 110$$

$$\therefore Q = 341 H^{3/2} \quad \text{CREST ELEV.} = 12.0$$

WEIR FLOW ACROSS THE CREST OF DAM. (ELEV. 17')

$$L = 2800' \quad C = 2.9$$

$$Q = CLH^{3/2} \quad Q = 8100 H^{3/2}$$

<u>STAGE</u>	<u>DISCHARGE</u>	<u>STAGE</u>	<u>DISCHARGE</u>
0	0	3.0	1772
.5	121	4.0	2728
1.0	341	5.0	3812
1.5	626	5.5	7262
2.0	964	6.0	13112

JUSTIN & COURTNEY, INC.
Division of O'Brien & Gere Engineers, Inc.
PHILADELPHIA, PA

SHEET NO. 18 OF _____

NAME OF CLIENT CORPS OF ENGRS.

DATE 3/25/78

PROJECT ABSOLEM DOUGHTY DAM

COMP. BY DEC

CHECKED BY LW

STORAGE - DISCHARGE RELATION
(HEC-1 INPUT)

STORAGE

DISCHARGE

0
113
231
354
482
752
1043
1353
1515
1682

0
121
341
626
964
1772
2728
3812
7262
13112

1/2 PMF DISCHARGE FROM THE RESERVOIR IS ABOUT
11200 CFS, OR A STAGE OF 5.85 FEET (.85 FEET
ABOVE THE TOP OF DAM.

JUSTIN & COURTNEY, INC.
 Division of O'Brien & Gere Engineers, Inc.
 PHILADELPHIA, PA

SHEET No. 10 OF _____

DATE 4/10/78

NAME OF CLIENT CORPS OF ENGRS.

COMP. BY DEC

PROJECT ABRAHAM DOUGHTY DAM

CHECKED BY _____

RESERVOIR DRAWDOWN - TWO 30" C.I.P.

ASSUME ORIFICE CONTROL & CULVERT FLOWING FULL

$$H = \left(1 + K_e + K_v + \frac{29.42L}{R_h^{1.33}} \right) \frac{V^2}{2g} \quad F \frac{V^2}{2g} = \frac{Q^2}{29\pi D^5}$$

$$H = \left(1 + 1 + 1 + \frac{29 \times .01^2 \times 24}{\left(\frac{2.5}{4}\right)^{1.33}} \right) \frac{Q^2}{29\pi (2.5)^5} \quad H = .00421Q^2$$

$$Q = 15.4 H^{1/2} \text{ (per pipe)} \quad Q_T = 30.8 H^{1/2}$$

H feet	12	10	8	6	4
Q cfs	111	102	92	81	69

ASSUME A SURFACE AREA PROPORTIONAL TO THE HEAD (H)
 WITH $A(0) = 0$ & $A(12) = 225$ ACRES

$$A = KH \quad \& \quad K = \frac{225}{10} = 22.5$$

H (FEET)	ΔH (FEET)	Q AVE (CFS)	AREA AVE ACRES	Δt (HOURS)	$\Sigma \Delta t$ (HOURS)
12	2	111	263	44	44
10	2	102	158	37	81
8	2	92	113	30	111
6	2	81	68	20	131
4	2	69	23	8	139

 HEC-1 VERSION DATED JAN 1973
 UPDATED AUG 74
 CHANGE NO. 01

DOUGHTY DAMS
 NATIONAL DAM SAFETY PROGRAM
 ONE HALF PROBABLE MAXIMUM FLOOD COMPUTATION

JOB SPECIFICATION
 NO. 50 MHR 1 0 0 1 JHR 0 0 0 0 IPLI 2 2 2 0
 JOPER 0 NMT 3 0

SUB-AREA RUNOFF COMPUTATION

1 ISTAQ 1 ICOMP 0 IECON 0 ITAPE 0 JPLT 1 JPRY 0 INAME 0

HYDROG IJHG TAREA SNAP TRSDA TRSPC RATIO ISNOW ISAME LOCAL
 0 -1 8.70 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

PRECIP DATA

NP 6 STORM 0.00 DAJ 0.00 DAK 0.00
 .10 .45 .80 4.65 1.45 .75

LOSS DATA

SIRKR 0.00 OL14R 1.00 RI10L 0.00 ERAIN 0.00 SIRKS 0.00 RI10K 1.00 STBIL 0.00 CNSIL 0.00 ALSX 0.00 RI10P 0.00

0. 62. 232. 497. 738. 829. 763. 622. 465. 349.
 265. 199. 150. 107. 82. 62. 49. 36. 27. 21.
 15. 12. 9. 7. 5. 3. 2. 0. 0.

UNIT GRAPH TOTALS 5607. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.00 QRCSM= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1 1 0	.10	.10	0.
1 2 0	.45	.45	6.
1 3 0	.80	.80	51.
1 4 0	4.65	4.65	204.
1 5 0	1.45	1.45	771.
1 6 0	.75	.75	1981.
1 7 0	0.00	0.00	3734.
1 8 0	0.00	0.00	5395.
1 9 0	0.00	0.00	6234.
1 10 0	0.00	0.00	6045.
1 11 0	0.00	0.00	5176.
1 12 0	0.00	0.00	4054.
1 13 0	0.00	0.00	3076.
1 14 0	0.00	0.00	2173.

1	15	J	0.00	0.00	0.00	1747.
1	16	0	0.00	0.00	1314.	
1	17	0	0.00	0.00	963.	
1	18	0	0.00	0.00	724.	
1	19	0	0.00	0.00	546.	
1	20	0	0.00	0.00	422.	
1	21	0	0.00	0.00	318.	
1	22	0	0.00	0.00	239.	
1	23	0	0.00	0.00	182.	
2	0	0	0.00	0.00	135.	
2	1	0	0.00	0.00	104.	
2	2	0	0.00	0.00	79.	
2	3	0	0.00	0.00	60.	
2	4	0	0.00	0.00	43.	
2	5	0	0.00	0.00	23.	
2	6	0	0.00	0.00	17.	
2	7	0	0.00	0.00	5.	
2	8	0	0.00	0.00	2.	
2	9	0	0.00	0.00	0.	
2	10	0	0.00	0.00	0.	
2	11	0	0.00	0.00	0.	
2	12	0	0.00	0.00	0.	
2	13	0	0.00	0.00	0.	
2	14	0	0.00	0.00	0.	
2	15	0	0.00	0.00	0.	
2	16	0	0.00	0.00	0.	
2	17	0	0.00	0.00	0.	
2	18	0	0.00	0.00	0.	
2	19	0	0.00	0.00	0.	
2	20	0	0.00	0.00	0.	
2	21	0	0.00	0.00	0.	
2	22	0	0.00	0.00	0.	
2	23	0	0.00	0.00	0.	
3	0	0	0.00	0.00	0.	
3	1	0	0.00	0.00	0.	
3	2	0	0.00	0.00	0.	

SUM 8.20 8.20 45974.

PEAK 6234. 6-HOUR 5106. 24-HOUR 1909. 72-HOUR 920. TOTAL VOLUME 45977.
 JFS INCHES 5.46. 8.17. 8.13. 8.19.
 AC-FY 2533. 3789. 3802. 3802.

HYDROGRAPH ROUTING
 ISTAQ ICOMP IECON ITAPE JPLI JPRT INAME
 2 1 0 0 0 0 0
 ROUTING DATA
 QLOSS CLOSS LAG AMSKK X TSK STORA
 0.0 0.000 0.00 0.000 0.000 0.000 -1.

STORAGE= 0. 70. 147. 233. 326. 428. 537. 655. 780. 1050.
 OUTFLOW= 0. 26. 74. 137. 210. 259. 298. 1129. 2615. 6786.

TIME EOP STOR AVG IN EOP OUT
 1 1 0 0 0 0
 2 0 0 0 0 0

1 5 0	488.	19.
1 6 0	1376.	85.
1 7 0	2858.	238.
1 8 0	4564.	1529.
1 9 0	5815.	4670.
1 10 0	6140.	5815.
1 11 0	5610.	5656.
1 12 0	4615.	4844.
1 13 0	3565.	3847.
1 14 0	2699.	2953.
1 15 0	2035.	2296.
1 16 0	1530.	1791.
1 17 0	1138.	1361.
1 18 0	843.	1054.
1 19 0	635.	865.
1 20 0	484.	693.
1 21 0	370.	548.
1 22 0	273.	426.
1 23 0	211.	329.
2 0 0	158.	295.
2 1 0	119.	290.
2 2 0	91.	284.
2 3 0	69.	277.
2 4 0	52.	271.
2 5 0	36.	264.
2 6 0	23.	256.
2 7 0	11.	247.
2 8 0	3.	237.
2 9 0	1.	228.
2 10 0	0.	220.
2 11 0	0.	211.
2 12 0	0.	199.
2 13 0	0.	186.
2 14 0	0.	175.
2 15 0	0.	164.
2 16 0	0.	153.
2 17 0	0.	144.
2 18 0	0.	135.
2 19 0	0.	127.
2 20 0	0.	119.
2 21 0	0.	112.
2 22 0	0.	106.
2 23 0	0.	100.
3 0 0	0.	94.
3 1 0	0.	88.
3 2 0	0.	83.
SUM		
44031.		

A31

INCHES	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
PEAK	4631.	1703.	882.	44091.
5815.	495	728	785	7.85
AC-FT	2298.	3379.	3646.	3646.

STATION 2

	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	0.	0.	0.	0.	0.
1 1 01
1 2 01
1 3 01
1 4 00I
1 5 00	I	.	.	.	.	.	.	.	.	.	.	.	.
1 6 00	.	I	.	.	.	.	.	.	.	.	.	.	.
1 7 00	.	.	I	.	.	.	.	.	.	.	.	.	.
1 8 00	.	.	.	I	.	.	.	.	.	.	.	.	.
1 9 00	I	.	.	.	.	.	.	.	.
1 10 00	I	.	.	.	.	.	.	.
1 11 00	I	.	.	.	.	.	.
1 12 00	I	.	.	.	.	.
1 13 00	.	.	.	I	.	.	.	.	.	.	.	.	.
1 14 00	I	.	.	.	.	.	.	.	.
1 15 00	I	.	.	.	.	.	.	.
1 16 00	.	.	I	.	.	.	.	.	.	.	.	.	.
1 17 00	.	.	.	I	.	.	.	.	.	.	.	.	.
1 18 00	I	.	.	.	.	.	.	.	.
1 19 00	.	.	I	.	.	.	.	.	.	.	.	.	.
1 20 00	.	.	.	I	.	.	.	.	.	.	.	.	.
1 21 00	I	.	.	.	.	.	.	.	.
1 22 00	.	I	.	.	.	.	.	.	.	.	.	.	.
1 23 00	.	.	I	.	.	.	.	.	.	.	.	.	.
2 0 00
2 1 00
2 2 00
2 3 00
2 4 00
2 5 00
2 6 00
2 7 00
2 8 00
2 9 00
2 10 00
2 11 00
2 12 00
2 13 00
2 14 00
2 15 00
2 16 00
2 17 00
2 18 00
2 19 00
2 20 00
2 21 00
2 22 00
2 23 00
3 0 00
3 1 00
3 2 00

SUB-AREA RUNOFF COMPUTATION

ISTAQ ICOMP IECON ITAPE JPLT JPR1 INAME

0 0 0 0 0 0 0

HYDROGRAPH DATA

IHYDG IJHG IAREA SNAP IRSDA TRSPC RATIO ISNOW ISAME LOCAL

0 -1 8.00 0.00 0.00 0.00 0.000 0 0 0

PRECIP DATA

NP STORY DAK

6 0.00 0.00 0.00

PRECIP PATTERN

0.10 .45 .85 4.65 1.45 .75

LOSS DATA

STRKR DLTGR RTIOL ERAIN STRKS RTIOK STRTL CNSTL ALSMX RTIMP

0.00 0.00 1.00 0.00 0.00 1.00 0.00 0.00 0.00 0.00

GIVEN UNIT GRAPH, NUHQ2= 28

0. 57. 214. 458. 680. 764. 703. 573. 428. 321.

244. 137. 74. 57. 45. 31. 24. 19.

13. 10. 7. 5. 3. 2. 1. 0.

UNIT GRAPH TOTALS 5154. GFS OR 1.00 INCHES OVER THE AREA

START2= 0.00 RECESION DATA ORCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1 1 0	0.00	0.00	0.00
1 2 0	0.45	0.45	0.00
1 3 0	0.85	0.85	0.00
1 4 0	4.65	4.65	0.00
1 5 0	1.45	1.45	0.00
1 6 0	0.75	0.75	0.00
1 7 0	0.00	0.00	0.00
1 8 0	0.00	0.00	0.00
1 9 0	0.00	0.00	0.00
1 10 0	0.00	0.00	0.00
1 11 0	0.00	0.00	0.00
1 12 0	0.00	0.00	0.00
1 13 0	0.00	0.00	0.00
1 14 0	0.00	0.00	0.00
1 15 0	0.00	0.00	0.00
1 16 0	0.00	0.00	0.00
1 17 0	0.00	0.00	0.00
1 18 0	0.00	0.00	0.00
1 19 0	0.00	0.00	0.00
1 20 0	0.00	0.00	0.00
1 21 0	0.00	0.00	0.00
1 22 0	0.00	0.00	0.00
1 23 0	0.00	0.00	0.00
2 0 0	0.00	0.00	0.00
2 1 0	0.00	0.00	0.00
2 2 0	0.00	0.00	0.00
2 3 0	0.00	0.00	0.00

2	5	0	0.00	0.00	18.
2	6	0	0.00	0.00	10.
2	7	0	0.00	0.00	3.
2	8	0	0.00	0.00	1.
2	9	0	0.00	0.00	0.
2	10	0	0.00	0.00	0.
2	11	0	0.00	0.00	0.
2	12	0	0.00	0.00	0.
2	13	0	0.00	0.00	0.
2	14	0	0.00	0.00	0.
2	15	0	0.00	0.00	0.
2	16	0	0.00	0.00	0.
2	17	0	0.00	0.00	0.
2	18	0	0.00	0.00	0.
2	19	0	0.00	0.00	0.
2	20	0	0.00	0.00	0.
2	21	0	0.00	0.00	0.
2	22	0	0.00	0.00	0.
2	23	0	0.00	0.00	0.
3	1	0	0.00	0.00	0.
3	2	0	0.00	0.00	0.

SUM 8.25 8.25 42519.

JES	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
INC-ES	5780.	4734.	1767.	850.	42520.
AC-FT		5.50	8.22	8.24	3516.
		2348.	3507.		

A34

***** COMBINE HYDROGRAPHS *****

ISIAQ	ICOMP	IECON	IIAPE	JPLT	JPRY	INAME
4	2	0	0	1	0	0

0.	6.	48.	740.	1936.	3712.	6539.	10451.	11414.
10442.	8594.	6634.	5101.	3910.	3000.	2250.	1717.	1367.
839.	642.	493.	413.	378.	346.	322.	299.	266.
250.	238.	228.	220.	211.	193.	186.	175.	164.
144.	135.	127.	119.	112.	103.	100.	96.	83.

JES	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
INC-ES	11414.	9023.	3445.	1732.	86611.
AC-FT		5.03	7.68	8.04	8.04
		4476.	6837.	7162.	7162.

***** HYDROGRAPH ROUTINGS *****

ISIAQ	ICOMP	IECON	IIAPE	JPLT	JPRY	INAME
4	1	0	0	0	0	0

QLOSS	CLOSS	AVG	IRCS	ISAME
0.0	0.000	0.00	1	0

MSIPS	MSIDL	LAG	ANSKK	X	ISK	SIORA
n	n	n	n	n	n	n

OUTFLOW= 0. 121. 341. 626. 964. 1772. 2728. 3812. 7262. 13112.

TIME	EQP	STOR	AVG-IN	EQP	OUT
1	1	0	0.	0.	0.
1	2	0	0.	3.	0.
1	3	0	2.	27.	3.
1	4	0	12.	122.	13.
1	5	0	48.	468.	51.
1	6	0	188.	1332.	187.
1	7	0	349.	2823.	614.
1	8	0	682.	5126.	1564.
1	9	0	1186.	8455.	3229.
1	10	0	1573.	10932.	9285.
1	11	0	1628.	10930.	11230.
1	12	0	1571.	9519.	9207.
1	13	0	1518.	7644.	7358.
1	14	0	1454.	5997.	5970.
1	15	0	1330.	4505.	4599.
1	16	0	1331.	3455.	3735.
1	17	0	1251.	2625.	3455.
1	18	0	1145.	1984.	3083.
1	19	0	1033.	1542.	2696.
1	20	0	926.	1224.	2344.
1	21	0	825.	960.	2013.
1	22	0	733.	741.	1714.
1	23	0	648.	568.	1462.
2	0	0	574.	453.	1240.
2	1	0	512.	395.	1054.
2	2	0	461.	362.	908.
2	3	0	418.	338.	795.
2	4	0	382.	311.	700.
2	5	0	351.	291.	620.
2	6	0	325.	274.	560.
2	7	0	303.	258.	507.
2	8	0	283.	244.	461.
2	9	0	266.	233.	421.
2	10	0	251.	224.	387.
2	11	0	238.	215.	357.
2	12	0	226.	205.	332.
2	13	0	216.	193.	312.
2	14	0	205.	180.	293.
2	15	0	196.	169.	276.
2	16	0	187.	158.	259.
2	17	0	178.	149.	243.
2	18	0	171.	139.	228.
2	19	0	163.	131.	214.
2	20	0	156.	123.	201.
2	21	0	149.	116.	189.
2	22	0	143.	109.	178.
2	23	0	138.	103.	167.
3	0	0	132.	97.	157.
3	1	0	127.	91.	147.
3	2	0	122.	86.	139.

SUM 85157.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
11230.	7941.	3310.	1703.	85157.
3FS	4.42	7.37	7.91	7.91
INC4ES	3940.	6568.	7041.	7041.
AG=ET				

STATION 4

INF. OW(I), OUTFLOW(O) AND OBSERVED FLOW(W)

	0	2000	4000	6000	8000	10000	12000	0	0	0	0	0	0	0	0	0	0
1 1 01
1 2 01
1 3 01
1 4 001
1 5 00 I
1 6 0 0	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1 7 3 0	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1 8 0 0	.	.	I	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1 9 0 0	.	.	.	0	.	I	.	.	.	.	.	.	.	.	.	.	.
1 10 0 0	0	.	I	.	.	.	.	.	.	.	.
1 11 0 0	0	I	.	.	.	.	.	.	.	.
1 12 0 0	0	I	.	.	.	.	.	.	.	.
1 13 0 0	0	I	.	.	.	.	.	.	.	.	.	.
1 14 0 0	10	.	.	.	.	.	.	.	.	.	.	.	.
1 15 0 0	I	.	.	.	.	.	.	.	.	.	.
1 16 0 0	I 0	.	.	.	.	.	.	.	.	.	.	.	.
1 17 0 0	I 0	.	.	.	.	.	.	.	.	.	.	.
1 18 0 0	I 0	.	.	.	.	.	.	.	.	.	.
1 19 0 0	I 0	.	.	.	.	.	.	.	.	.
1 20 0 0	I 0	.	.	.	.	.	.	.	.
1 21 0 0	I 0	.	.	.	.	.	.	.
1 22 0 0	I 0	.	.	.	.	.	.
1 23 0 0	I 0	.	.	.	.	.
2 0 0 0	I 0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2 1 0 0
2 2 0 0	I 0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2 3 0 0
2 4 0 0	I 0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2 5 0 0
2 6 0 0	I 0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2 7 0 0
2 8 0 0	I 0	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2 9 0 0
2 10 0 0
2 11 0 0
2 12 0 0
2 13 0 0
2 14 0 0
2 15 0 0
2 16 0 0
2 17 0 0
2 18 0 0
2 19 0 0
2 20 0 0
2 21 0 0
2 22 0 0
2 23 0 0
3 0 0 0
3 1 0 0
3 2 0 0

RUNOFF SUMMARY, AVERAGE FLOW

	PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT					
ROUTED TO	1	6234.	5106.	1909.	920.
	2	5815.	4631.	1703.	882.
HYDROGRAPH AT	3	5780.	4734.	1762.	850.
2 COMBINED	4	11414.	9023.	3445.	1732.
ROUTED TO	6	11230.	7941.	3310.	1703.
					16.70
					16.70

PREVIOUS INSPECTION REPORTS

Annual Report - Dams

MAY 17 '68

DEPT. CONC. & ECON. DEV.
DIVISION OF
WATER POLICY AND SUPPLY

Application No. 9

For year: 1968

Name of Dam ABSALOM DOUGHTY POND

Date of Inspection: May

Owner, Name CITY OF ATLANTIC CITY

Address City Hall, Tennessee & Atlantic Aves.
Atlantic City, N. J. 08401

Description of condition of the following:

1. Embankment (Erosion, seepage, etc.) Embankment is in good condition. The no evidence of erosion or seepage on the down stream face. The rip-rap, on the up stream face consists of 12'x12' concrete slabs, some of which have settled due to erosion of embankment below waterline. This condition has been corrected by hydraulically packing sand through opening at the joints of the slabs above the waterline.

2. Spillway (Concrete spalling, timber rotting, leakage, etc.) Spillway is constructed of concrete and is in good condition; there is no spalling concrete.

3. Emergency Spillway (Erosion, growth of sod, riprap, etc.) There is no emergency spillway.

4. Outlet Works (Work ability of valves, gates; Condition of pipe; etc.) The outlet pipes are all working properly. One blow-off valve requires a replacement of its valve stem.

5. Inlet stream (s) (Silt deposition, etc.) There are two (2) inlet streams and both are clear of silt deposits.

6. Outlet stream (Scouring, undercutting of dam, etc.) Condition of stilling basin, if any. Outlet stream has a stilling basin which is in good condition and there is no evidence of scouring or under-cutting of the dam.

7. General

a. Did flood waters overtop dam during period of report?
If so, at what stage and date thereof. Flood waters overtop the spillway of the dam but not the dam itself. This overtopping is continuous most of the time.

b. Report on any other condition not covered above. None.

c. In your opinion, does existing condition warrant repairs?
If so, where and to what extent. With the exception of replacing valve stem on one of the outlet valves and continuing the packing of sand under the rip-rap slabs, the existing conditions do not warrant repair.

- d. Submit photographs of the upstream and downstream faces of the embankment, main spillway and emergency spillway noting date taken. The required photographs are herewith attached.

~~Use additional sheets where necessary~~

Inspected by *Joseph A. Dehnick*

Joseph A. Dehnick, P.E.

~~Consulting Engineer~~

N.J. License No. 1844

Date: May 15, 1968

application 9

Report on Dam Inspection

LOWER DOUGHTY POND

DAM NO. 36-1

LOCATION 36.13.2.2.1

On April 20, 1942, in company with Mr. Max Grossman, Superintendent of the Atlantic City Water Department, inspection was made of the repairs which have recently been completed at the spillway of the lower pond of the Atlantic City Water Department on Absecon Creek at Absecon, Atlantic County.

The spillway and wing walls have been repaired by the use of "Gunite" and a very good job has been obtained. There is a small amount of seepage evident on the downstream face of the spillway, which worries Mr. Grossman, but which did not appear serious to the writer.

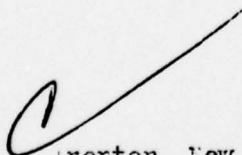
At the present time forms are in place for additional training walls, which will eliminate pockets behind the spillway wing walls, in which floating material formerly gathered.

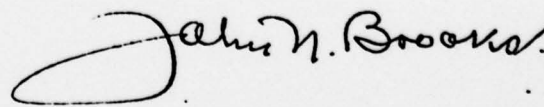
A Cochrane indicating orifice meter has been installed in the pipe line leading from this pond to the pumping station, and at the time of inspection delivery was at the rate of 2.0 m.g.d.

The pond level was 2 feet below the crest of the spillway.

The total delivery from the pumping station at the same time was 13.5 m.g.d.

The present condition of the dam and spillway is satisfactory and no action is required.


Trenton, New Jersey
April 22, 1942


John E. Brooks,
Assistant Division Engineer